Page 15-16 was index for vol. 28, 1924

TELEPHONE ENGINEER

VOLUME 29 JANUARY, 1925 Number 1

TELEPHONE SECURITIES ENTITLED TO HIGH RANK

In a conversation recently, an attorney associated with a prominent firm of corporation lawyers expressed the opinion that as a class, telephone securities are entitled to the highest rank of all utility securities, when viewed from the standpoint of the investor. Since the firm with which he is associated has a wide acquaintance with corporation affairs, it may be assumed that he knew whereof he spoke.

Yet in the city of several hundred thousand where this conversation took place within the past year but two or three issues of telephone securities were placed in the hands of financial houses, or were offered to the public, while issues of various other types of utilities were plentiful. A country bank subscribing for several thousand dollars in one of the telephone issues was allotted one-half of its subscription.

Investment houses and individual investors, which have given a high rating to utility securities for several years, but recently have come to recognize that telephone securities as a class have features of stability and on that account are even more attractive than many other utility issues.

All telephone men do not yet seem to understand that this change has taken place, for remarks still are heard concerning the difficulty of financing, even of fair-sized properties. The age is gone when telephone stocks were in a class with wildcat or unlisted oil stocks, but some telephone managers do not seem as yet to recognize the fact.

As has been pointed out repeatedly in these columns, little difficulty is experienced today in financing a telephone property, if it has the essential items of good management, adequate rates, and net revenue sufficient to provide the proper margin of safety.

STATISTICAL PICTURE OF THE TELEPHONE INDUSTRY

The 1922 report on the census of telephones, recently issued by the Department of Commerce, gives an interesting picture of the telephone industry from a statistical standpoint. Although the figures are, now, two years old on account of the time required to collect and compile the statistics and publish the report, they are the latest complete figures on the industry.

If anyone thinks the telephone is a small industry, let him note that there were invested in telephone plant and equipment at the close of 1922 nearly two and one-quarter billions of dollars. The total revenue for the year amounted to nearly six hundred and eighty-five millions of dollars. On the payrolls of telephone companies were 312,015 employees who received $352,925,550 for their services.

Three states—New York, Illinois and Pennsylvania—had over one million telephones each and Ohio was only a few thousand short of the one-million mark. During the five-year period, from 1917 to 1922, the number of telephones for the entire country increased 22.5 per cent and the number of miles of wire increased 29.3 per cent. Every state in the Union showed an increase, ranging from 3.0 per cent in North Dakota to 58.6 per cent in Wyoming.

To serve the 14,347,395 telephones, required 37,265,958 miles of wire on 694,567 miles of pole line and connected to 19,260 central offices. Phantom circuits added 643,608 miles to the mileage of physical circuit. Over 102,000 business houses and other institutions had private branch exchange systems to serve their telephone needs.

Certainly, it is not necessary to labor the figures further to prove to anyone engaged in telephone work that he is part of a great industry and, by reason of interconnection of lines of the various systems, one that is functioning practically as a single unit to provide an adequate communication service to the inhabitants of our country, whether they be located in the largest city or in the most remote ranch of a western state.

SUGGESTION ON THE MUTUAL LINE PROBLEM

One characteristic of the telephone business is the large number of mutual, or co-operative, associations and companies operating relatively small systems in the rural districts of the country. Bureau of Census figures show over 55,000 systems reporting less than $10,000 revenue per year. A very large percentage of these fall

into the mutual, or co-operative, class. Some states have as many as a thousand of these systems.

All telephone men who are engaged in the business in a commercial way recognize that the future of these associations constitutes a real problem of the business. With the exception of an almost infinitesimally small number, even the best of them have never been characterized by a progressive policy of management, and the majority of them can, almost, be said to have had no management at all.

Built fifteen or twenty years ago, the lines of these associations have deteriorated to the point where service beyond the limits of the line is, almost, out of the question. There are hundreds of cases where neighboring companies hesitate to accept a call for a party on one of these lines because it is almost certain that it will be impossible to carry on a satisfactory conversation.

In the near future hundreds of these co-operatives will be faced with the necessity of rehabilitating their lines, or abandoning service entirely. The coming of rural electric lines and sundry sleet storms are hastening that day, and where these have not been experienced, natural deterioration due to the action of the elements is getting in its deadly work.

When the end comes, will arise the problem of how telephone service is to be supplied to those particular areas. In some cases neighboring companies will be glad to take over the territory and develop it, but there are large areas which no commercial company would be willing to take because the revenue to be derived will not even pay operating expenses. The only solution in such cases would seem to be a continuation of the co-operative form of organization.

Since this seems to be necessary, it follows that such organizations should be placed on a better basis than they were originally, and this means that some outside agency must be available to assist in the reorganization. The neighboring commercial telephone company is handicapped, in many such cases, by an element of suspicion that the assistance is being given from motives of personal gain. State telephone associations have something of the same handicap, and the agents of telephone manufacturers no longer are as active as they were in the early days, when orders for switchboards and telephones were in sight.

There is, however, one agency which has not yet been brought into the problem that would seem to have possibilities. This is the state land grant college. These colleges have given extensive service to the farmers of the country and have earned their confidence. They have field men working in the interests of the farmer and for various industries in their respective states, and this service easily might be extended to the telephone, if the need were presented and the proper financial support were available.

To be successful such field work would have to be in the hands of a carefully selected man, working under the auspices of the college but co-operating closely with the state telephone association. Such a man, putting in full time, could accomplish much in the way of improving conditions not only among the co-operatives, but among the smaller, privately-owned exchanges. We can only make the suggestion that this seems worth a trial, and we hope that some progressive state associations will get in touch with its state college to make arrangements for such a venture.

TELEPHONE ENGINEER
Vol. 29 January
No. 1 1925
Entered as second-class matter, June 6, 1922, at the post office at Chicago, Ill., under the act of March 3, 1879.

General Business and Editorial Offices, 28 E. Jackson Blvd., Chicago, U. S. A. Telephone: Harrison 4000.
W. H. Graffis.....Gen. Mgr.
R. V. Achatz.....Technical Editor
Chas. W. McKay.....Associate Editor
Herbert Graffis.....Bus. Mgr.
Jos. M. Graffis.....Advertising Mgr.
Eastern Office, 56 W. 45th St., New York. Tel. Vanderbilt 3695.

SUBSCRIPTIONS
The subscription price of TELEPHONE ENGINEER is $2 a year in the United States, Cuba and Mexico; in Canada it is $3; in all other countries $4. Single copies, U. S. A., 20 cents.

ADVERTISING
TELEPHONE ENGINEER is issued the 15th of each month. Copy can be accepted as late as the 8th of the month preceding date of publication. Where proof must be seen, allow ample time for transmission in the mails. Display Advertising — Rates on application. Classified Advertising—"Wants," "For Sales," etc.—$4 an inch, or 7 cents a word per insertion.

ANNUAL REPORT AS A MEANS OF PUBLICITY.

With the close of the year comes the job of making up annual report statements. This, apparently, is looked upon by many managers as an unpleasant duty rather than as an interesting study of the financial operations of the company during the past year. Of course, the reports to the various commissions must be made in writing, but very frequently the reports to stockholders are merely verbal statements made at the annual meeting; or, at best, bare financial statements. To the public, no information is given at all.

Some companies have found the annual report a very effective means of publicity, and some go as far as to pay for space in local papers to tell the story of their operations of the past year and their plans for the next. To the average person the balance sheet and the income statement mean little, but, with explanations, they may be made to convey a great deal of information and to build up respect for the character of the company. One method of giving these explanations is to interline the statement with brief explanatory paragraphs, giving the substance of the material covered by each account.

Not only are the financial statements of interest when properly presented, but a frank discussion of the operating difficulties met—and, above all, a summary of the work of construction also may be made to advantage.

The Year 1924 in Review

A Brief Survey of the Accomplishment of the Year Shows That 1924 Was a Year of Extraordinary Growth and Consistent Progress in All Departments of the Telephone Industry

By THE EDITOR

The close of the year 1924 brings the opportunity to record another year of remarkable growth and development in the telephone industry. Each year since the return of the telephone properties of the country to private control, after wartime government operation, it has seemed that the high point in telephone expansion has arrived. Yet, each succeeding year has passed its predecessor, and the time when the rate of growth will decrease still does not appear on the horizon. Along with the growth in size of the telephone system of the country, there has been a continued improvement in the methods and agencies by which telephone service is rendered.

With an increase in plant investment for the year reaching into the neighborhood of $300,000,000, the total investment in telephone plants is now very close to the three-billion dollar mark. Few industries of any description exceed the telephone industry in point of money invested, and probably none of the larger industries exceed it in rate of growth. Its growth continues to be greatest in the larger centers of population, but there has been some improvement in the smaller cities and the country towns during the past year. This, probably, is due to the better conditions of the farmer toward the close of the year. With the return of normal prosperity in the rural districts, the smaller exchanges may expect to be called upon for greater expansion than has been required of them in the industry's growth of the last three years.

Industry's Financial Situation.

Financing of the enormous growth of the telephone business has been no small problem, but it is one that has been met successfully by most of the larger companies. The issue of $150,000,000 in new common stock by the American Telephone and Telegraph Co. was absorbed by the investors of the country with scarcely a flutter in the market price of the stock. The Home Telephone and Telegraph Co., of Fort Wayne, Ind., marketed $1,500,000 preferred stock and $1,000,000 bonds, a large portion of the issues being placed with investors in the territory served by the company. Casual figures, compiled from Public Service Commission and news reports, show that cases involving the issue of stocks, bonds and notes totaling more than $10,000,000 by Independent companies were before the various state commissions during the last six months of the year. These figures make no pretense to completeness and a considerable portion of the issues were in cases involving reorganizations or purchases of property. However, the amount indicates a broadening market for telephone securities. It may be noted that few Class A companies were included in the figures just given.

The problem of financing the small company has not yet been solved. The "Texas Plan" seems to be working very successfully in that state, but other states, which have a commission form of regulation, do not seem to have found as yet a means of working out similar plans. Some of the better managed small companies have found methods of financing and have been doing much work to improve their properties, but there still are many companies in need of such assistance.

Elimination of Competition; Territorial Division.

A number of the remaining competitive situations in the country were cleared up during the year either by purchase and sale, or by division of territory. The largest property involved was the Independent property at Louisville, Ky., and about fourteen other nearby points. The greatest activity in this line was in Pennsylvania, where a number of consolidations took place, or are in the process of completion. In general, these were effected through a division of territory. Wherever a strong Independent company existed which was capable of financing the development of its territory, the Bell property has been acquired by the Independents, while the Bell has absorbed the Independent properties which were less favorably situated. The net results of the consolidations probably will be an increase of several thousand stations in the independently operated exchanges of that state. In a number of cases, properties that have been operated under other names, although for some time past owned by Bell companies, have been formally incorporated into the Bell System.

In a number of states, where division of territory had been made between Bell and Independent companies in the past, rectification of territorial divisions recently has been made in the interest of establishing more compact operating units. The Tri-State Telephone and Telegraph Co., of St. Paul, Minn., acquired Bell property in several counties of southwestern Minnesota under such an arrangement, and similar changes have been taking place in Illinois and other states.

Also, there has been some tendency toward consolidation of Independent properties into larger systems through the formation of new companies to take over several existing systems. The greatest activity in this line is centered in Illinois and Ohio. In all of the operations involving relations between Bell and Independent companies, the letter and spirit of the Hall memorandum appears to have been observed and the results have been generally satisfactory to both sides of the industry.

Rates and Revenues.

The increasing cost of telephone plant has necessitated still further rate increases during the year. In general, the Independent companies have experienced little difficulty either with commissions or with their subscribers, but a number of the Bell companies have not been so fortunate. A number of the Bell companies are operating with rate schedules established under Federal court orders, in cases where state commissions refused to permit increases or ordered decreases. In practically all of the cases which have been taken to the Federal courts, the telephone companies have been sustained as against state commission orders.

Concerning Association Activities.

The activities of the national and state telephone associations continued to grow during the year. A distinct step in advance was made by the calling of a conference of Class A company executives by the United States Independent Telephone Association. This resulted in the formation of general committees to study different phases of the business. The sectional conferences at the national convention, under the direction of the accounting, plant and traffic divisions, were very well attended and distinct progress was made toward establishing means for exchanging experience and developing improved methods of procedure in the operation of telephone systems. The U. S. I. T. Association also

represents the Independent side of the industry at Washington and in the activities of the American Engineering Standards Committee, as well as in numerous conferences and other activities which are of interest to the communication systems of this country and the rest of the world.

State associations have continued to increase the service given to companies in their respective states. A number of the state associations have paid officials who are giving full time to the affairs of their associations and the member companies. They have represented these companies in matters relating to their general welfare in the respective states, and the state association offices have become clearing houses for a large volume of business related to every phase of telephone work. One new state association, that representing the Carolinas, was added to the list during the year.

In many of the states the work of the state association has been extended to the smaller companies through the media of district meetings or district associations. This method of reaching the companies who feel that they can not carry the expense of attending state conventions has been found to be very successful in Minnesota, Illinois, Indiana and other states.

Technical Advances.

A number of important technical advances were announced during the year. Several of the new practices may, likely, have a pronounced effect on the art of the future, particularly in long distance practice and in multi-office exchanges.

One of the more important announcements was the adoption of a new transmission unit by the Bell System, replacing the old "mile of standard cable" by a new unit of approximately the same dimensions but expressed as a power radio.

The "straightforward trunking" method, developed and placed in service during the year, promises much in the way of improvement of trunking service between offices of multi-office exchange areas. This system, involving direct selection of the trunk by the A-operator and the elimination of the order wire, seems to have many operating advantages over the old scheme. One system developed by the Stromberg-Carlson Telephone Mfg. Co. is in use in the Glenwood office of the Rochester Telephone Corp., and another system is being tried in Boston offices of the New England Telephone & Telegraph Co.

The extension of long-distance cables between important centers has proceeded rapidly during the year and it will be only a matter of a short time until Chicago and New York are connected by cable circuits. A new direct cable from New York to Harrisburg, Pa., was cut into service, providing additional circuits and relieving the former cable which was routed through Philadelphia. The development of the long-distance cable system has brought about a number of new methods of transmission. It is understood that the system of application of carrier currents to cable conductors is well advanced toward a practical solution. A new telegraph system applicable to long-distance cable circuits also has been developed.

In the outside plant, a method of applying preservative treatment to poles in service has been adopted by the Western Union Telegraph Co. New types of cable terminals have been developed which are intended to provide improvement over the types now in use.

There has been constant improvement in design and manufacture of apparatus and in the applications to circuits. Several new panel-type machine switching offices were cut into service in New York City and many new offices of the step-by-step type were installed. The "Strowger Director" system has been installed in the Havana, Cuba, network and is now in operation. In the smaller cities, the common battery switchboard with automatic features has held its popularity and many new office equipments have been cut into service.

Radio Telephony.

The construction of broadcasting stations and the sale of receiving apparatus for radio telephony continued to be a feature of the development of radio telephony. The congestion of broadcasting stations is now very great and no immediate solution is in prospect. The most important feature of the situation from the standpoint of the wire companies has been the rapid development of interconnection between broadcasting stations by means of land lines. During the weeks preceding the national election, it was a common matter to connect a number of stations so that a political address might be broadcasted from several points to reach a larger group of listeners. It is not uncommon to find the same program now broadcast from two or more stations. This development goes to strengthen the belief that radio and wire lines are co-ordinate services, rather than competing methods of communication.

The application of carrier-current telephone systems to power lines for dispatching and operating service continues, one manufacturer alone reporting the installation of 30 such sets of equipment during the past year. Carrier telephone and telegraph circuits also have been extended as fast as traffic requirements and economical operation required.

Bell's Machine-Switching Work

The State and Central exchanges of the Illinois Bell Telephone company, Chicago, were converted to panel type machine switching last year. These exchanges serve business firms entirely, being located in the heart of the city. A new building is being erected for the Superior exchange at Erie and Dearborn streets, Chicago, and all the business houses and other individual lines in that district will be cut over to automatic switching about the end of 1925.

The Bell policy is to convert to machine switching only as occasion arises, or as developments take place. Whenever a telephone building or equipment in the business district gets into poor condition; whenever a fire takes place or any considerable part of the apparatus is damaged or rendered undesirable, then the company aims to replace with machine switching.

Four-party lines, such as are common in the residential districts, are not considered financially attractive from a machine-switching standpoint. In fact, the coin-box subscriber, who often desires the attention of an operator, is not generally regarded with favor by the Bell company for machine switching.

The company plans, however, to broadly extend and expand the use of machine switching in a gradual, logical sort of way. Several new exchanges in New York have been converted to this type the past year. Peoria, Champaign and Urbana, Ill., all are being made over into new style, step-by-step systems. All of the Bell's new exchange buildings, now and for some time past, have been built with ceilings sufficiently high to accommodate machine-switching equipment.

Interstate Advertising to Squash "Phone Spongers"

Spokane, Wash.—A newspaper advertising campaign to cure the evil of "phone sponging"—borrowing telephone service—is to be conducted by the Interstate Utilities company. The company plans this campaign for the assistance of its subscribers in confining the use of their telephones to those entitled to them.

Max McGraw's System Continues Growth

Sioux City, Ia.—The Dakota Public Service Co., Dakota division of the Platte Valley Power and Light Co., which is headed by Max McGraw, now owns the telephone plants at Woonsocket, Artesian, Kimball and Pukwana, S. Dak., in addition to the electric plants in 13 South Dakota communities.

Zoning and Plant Design

Factors to Be Considered in Co-ordinating City Zoning Ordinances and Plant Design Call for Intelligent Team-Work—Controlling Conditions

By ALBERT P. ALLEN*

(*Commercial Engineer, Illinois Bell Telephone Company*)

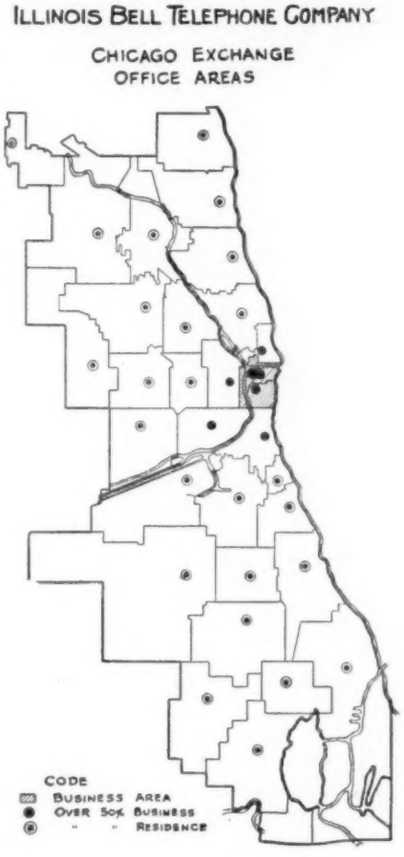
In many ways a suitable title for this paper would be "The Design of the Telephone Plant and Its Effect upon the Preparation of Zoning Ordinances." In suggesting this title, it must not be assumed that the telephone interests are in any way antagonistic to the plan, which has met with so much favor in recent years, of systematic zoning of the larger cities in order that their future growth may be controlled and regulated along lines which contemplate, and undoubtedly will secure, the best results for the citizens as a whole. The telephone company, necessarily, is a part of the city in which it operates and is dependent on that city's successful growth. Therefore, anything which is for the ultimate benefit of the city must be of benefit to the telephone company.

In addition, however, to this general interest which the telephone company takes in common with other good citizens, it has a second and even stronger reason for being favorable to the establishment and maintenance of a good zoning ordinance in each city. Such ordinances tend to stabilize and make more dependable the development in the various sections of a city, and, therefore, tend to make easier and more reliable its estimates of future growth and plant requirements in such sections.

From the point of view of the telephone company, the design of the telephone plant in any city is almost wholly controlled by the service demands of the public; and unless the zoning ordinance (and, incidentally, all other ordinances) enforced in any city, is drawn in accord with those service demands, any changes in the design of the telephone plant which are caused by such ordinances, although opposed to the facts of the business, can be shown to be harmful rather than beneficial to the public as a whole.

The true interrelationship between the zoning of cities and the carrying on of the telephone business within them can be understood only by those who not only appreciate the real relationship of the present-day public service corporation to the public it serves, but also understand how and why a modern telephone plant is built as it is. These questions are both large subjects, and, in this short paper, the writer can do little more than call attention to some of the basic facts, without going very deeply into the supporting arguments and explanations regarding them.

The first important fact is that the telephone company, being publicly regulated as to the rates it may charge, can have no selfish or mercenary motive in either supporting, opposing, or criticizing any given zoning law or regulation. Its position necessarily is a neutral and professional one of interest in efficiency and economy for the ultimate benefit of its patrons, the public. It is not the stockholders, but the customers, of a telephone company who should be most interested that no unnecessary costs of providing service are imposed on the company, because it is they, and not the stockholders or employees, who suffer from, and have to pay for, such costs. This is the first point which must be appreciated by those who have the duty, or privilege, of establishing zoning, as well as all other, regulations affecting the utility services.



The second important fact affecting telephone companies is that the proper and economical plan on which they must build is controlled within rather narrow lines by their customers and by the facts of the business, and not merely, as one might assume, by the whims or theories of their engineers. Each central office or exchange building has to meet several rigid conditions, all controlled by the present and future number and distribution of the customers to be served therefrom, as follows:

1. It must be within economical transmission distance of all the subscribers it serves.
2. It must serve the total number of subscribers to be located within such economical radial distance.
3. Each subscriber must be directly connected by a pair of wires (or an individual or party-line basis) with the switchboard at such a central office.
4. All such central-office switchboards in a city must be interconnected, by suitable inter-office trunks, for direct and instantaneous connection on local calls, and for prompt connection to all toll or "Long Distance" points outside that city or exchange area.
5. Each central office must be located at the economical "wire center" (or telephonic "center of gravity") of the area it serves, with due allowance for the effect of the trunk circuits and cables on the final determination of such economical centers of distribution.
6. In small cities, which can be served by a single wire center and office, the center often falls in or near the business district.

In large multi-office exchanges, however, many sub-areas serve residence stations almost exclusively. Moreover, the densest development often occurs in the better neighborhoods, in which case the economical wire center may be determined as lying well within some highly restricted zone.

7. To move a central office far from its natural economical wire center adds greatly to the investment in conduit and

An address presented at the meeting of the City Planning Division of the American Society of Civil Engineers.

cables and to the corresponding costs of giving service, since, as previously stated, all subscribers' lines must be carried into the central office.

8. Telephone central offices should be located in clean, quiet neighborhoods, free from the noise, smoke and dirt of steam railroads, street cars, or heavy street traffic.

It will be noticed that all the eight conditions mentioned have to do with the location or size of the telephone central office, and that none of them has to do with the other features of the design of the physical plant. Such features as the use of underground or aerial construction, system of distributing wires to reach the premises of individual subscribers, type of switchboard, and other matters which are usually thought of in connection with a telephone plant, are in no way controlled by the regulations of a zoning ordinance. Therefore, it may be said, in general, that this discussion involves only the location and size of central office buildings which are called for by an efficient and economical design of the telephone plant as a whole. Obviously, such a design must be interfered with as little as possible by the conditions of a zoning ordinance if the telephone service is to be rendered in the most economical manner and at the lowest possible rates.

Moreover, the telephone company would not raise these points if their effect on the cost of service was not known to be great enough to be a controlling factor in the determination of necessary rates for service; and, especially, if the differences in cost would be eliminated, instead of being accentuated, by growth, as time goes on. In several cases, if the zoning ordinances had been passed as originally drawn, and had not been changed at the suggestion of the telephone company, the cost of telephone buildings and cable plant would have been greatly increased.

The various conditions which have been listed as controlling the proper location and size of telephone central offices will now be discussed a little more in detail. These conditions should be recognized as important and necessary in the zoning ordinance itself, and by any Board of Appeals which may be created under such an ordinance.

1. *A Central Office Must Be Within Economical Transmission Distance of All the Subscribers It Serves.* By "transmission distance" is meant the combination of length of circuit and size of conductors which apply to the lines of the various subscribers served by any one central office. Although it is true that the state of the art today will enable telephone engineers to produce proper telephone transmission over almost any length of circuit, nevertheless, it is obvious that there is a practical distance from the central office battery supply beyond which it is uneconomical to attempt to serve subscribers in any exchange, due to the constantly increasing quantities of copper that would be needed, or the reactions on transmission that would result, if those large quantities are not provided.

There is no uniform or fixed maximum distance which is applied even to common battery subscribers, because the cost varies with the number of circuits in a cable as well as with the length and size of the conductor used to supply any given section. Moreover, the strict maintenance of an inflexible maximum distance would create uneconomical fractional office areas in any large city. For all practical purposes, however, this first condition means that the distance which any subscriber can be located from the central office is quite limited, and this condition creates the necessity for a large number of central office buildings throughout any large metropolitan area. Moreover, it means that the location and size of the various areas are fixed by the service demands of subscribers and not in any arbitrary way by the telephone company.

2. *A Central Office Must Serve the Total Number of Subscribers to Be Located Within Its Economic Radial Distance.* This condition will probably be recognized by all engineers as a necessary corollary to Condition 1. It forms the basis for the economic necessity for the ultimate size and height of the telephone building which must be permitted.

3. *Each Subscriber Must Be Directly Connected with the Switchboard Located at Such a Central Office.* This also states one of the obvious conditions of modern telephone service, and it affects both the location and the size of the central office building, when considered in connection with Condition 4. It illustrates the partciular feature which perhaps chiefly distinguishes the distribution of telephone service, if that term can be used, from the distribution of other utility services, either transportation, electric light, electric power, gas, or water, the difference being that each telephone subscriber has to have his own individual connection with the source of service supply, whereas all other utilities serve their customers by common mains, or facilities used in common by large groups of patrons. However, they, too, have important problems to be considered in connection with zoning.

4. *All Central Office Switchboards Must Be Interconnected by Suitable Inter-Office Trunks.* The reason for this condition is that all central office switchboards must be available for complete inter-office local service; and also, of course, that they be made available for toll service throughout the telephone system. Thus, a subscriber in Detroit, Mich., has his own connection to his local switchboard, and by means of a trunk to "Long Distance," a toll line to New York, N. Y., a trunk from the toll-board in New York to a local central office there, and connection with the circuit connecting a New York subscriber with that central office, he can converse with the subscriber in New York with a minimum possibility of interference from any other subscriber. All parts of such a system of interstate telephone connection are so balanced in regard to transmission standards as to give the greatest economy of plant costs for the combined system as a whole.

The exact method of obtaining this balance of transmission requirements between the various parts of the system is quite technical, and would require a long paper for its complete explanation. For the purposes of this discussion, therefore, it must be taken for granted that the economical balance between these factors has been fairly well determined, and that any conditions arbitrarily imposed on the telephone company, which would upset that balance, would be very unfortunate to the users of telephone service because of the increased costs which would result therefrom.

5. *Each Central Office Must Be Located at the Wire Center of the Area It Serves.* The wire center, or location of the central office, is the telephonic center of gravity of that part of the city which it serves. Obviously, it is not always, if ever, the exact geographic center of that area, being moved away from such a center by a preponderance of either subscribers' circuits, or more expensive but fewer trunk circuits lying in one direction as compared with the opposite direction. It is a center, therefore, which is determined by a study of the present and ultimate number and distribution of subscribers. The actual location of the central office building cannot be moved far from the theoretical center without a large increase in the cost of service.

The extra cost due to such a move of the actual from the theoretical wire center is especially costly in the case of a central office which has already been planned; which will be put into service in a few years; and which, therefore, has had its effect on the underground conduit, pole line, and cable work already completed in accordance with such fundamental plan.

In the same way it would be very expensive to change the ultimate capacity of a building already in service by preventing, through a zoning ordinance, for instance, the completion of the building to its contemplated height or size, thus making it impossible to fulfill Condition

2, which specified that it must serve the total number of subscribers located within the proper radial distance from it. The only alternative, as can easily be seen, is to create an additional, uneconomical, inefficient, and costly central office to serve those subscribers thus ruled out of their natural wire center.

6. *In Large Multi-Office Exchanges Many Sub-Areas Serve Residence Stations Almost Exclusively.* This fact makes it impossible, without prohibitive cost, for the telephone company to serve residential areas without placing some telephone offices within and near the center of such natural residential areas. The telephone company much prefers a location which is acceptable rather than objectionable to the residents in the immediate neighborhood. It can be trusted, therefore, to select locations satisfactory to the public whenever this is possible without adding too greatly to the total cost of the service. Moreover, the Bell System and, the writer, believes, practically all telephone companies, have made it a practice for a great many years to employ the best architects and to construct a type of building for use in residential areas which is attractive in itself and which conforms as fully as possible to the surroundings in which it is to be placed. In many instances, as a matter of fact, a telephone building is an admitted benefit to the neighborhood, and, architecturally, is as unobjectionable as a public library, school, or art museum which are often located in residential sections.

7. *To Move a Central Office Far from Its Natural Wire Center Adds Greatly to the Investment in Conduit and Cables.* The reasons for this increased cost have been clearly indicated; and in any instance which might arise under a zoning ordinance, the local engineers could calculate closely just what the expense of any proposed change in plans would mean, both at the present time and ten or fifteen years hence, which is often more important. The calculations would show that any move of a central office from its natural wire center will add greatly to the investment in conduit and cable.

8. *Telephone Central Offices Should Be Kept as Free as Possible from the Dirt and Smoke of Steam Railroads, Street Cars, or Heavy Traffic.* Dirt and smoke are always objectionable to an operating force, and are also particularly harmful to the delicate apparatus in the central office equipment of a telephone company. Noise is also objectionable in an operating room, and even the operators are taught to speak in low tones in order not to disturb adjacent operators and not to create an air of confusion in the operating room. With the introduction of machine-switching service, the objection to smoke and dirt is somewhat increased; but even then the objection to noise remains, because the human element is never eliminated from the central office, even when most of the regular connections are completed by machinery.

Therefore, any provision of zoning which would assume that a telephone office might just as well, if not more logically, be located on a business street or in a district reserved for ordinary industrial uses, rather than on a quiet residential street, involves objections to such a procedure over and above the direct cost which it might add to the giving of service.

In addition to the statement just given a few points will be mentioned, that should be kept in mind when a zoning ordinance is being drafted. They are offered for the protection of the telephone subscribers against unreasonable and unnecessary additional costs for service, which will result if they are overlooked.

1. The ordinance should permit the erection of telephone buildings in any use district, in order that they may be located at the wire centers.

2. The ordinance should permit the erection of telephone buildings to economical heights. For example, if the height limit in residential districts would not permit of an economically designed building, provision should be made whereby exemption could be obtained to permit the erection of the building to a satisfactory height. In this connection, it must be remembered that each floor of a modern telephone building requires about 13 feet of height.

3. The ordinance should also permit a reasonable use of the plot on which the building is to be located. Some ordinances restrict to a very low percentage, in certain areas, the area of lot which may be occupied by the building. This may constitute an unnecessary and unreasonable restriction if all the facts about the erection of the usual telephone building are considered.

4. Provision should be made to permit the completion of buildings constructed prior to the adoption of an ordinance to less than the height or bulk to which they were originally designed. This is an extremely important provision, and certainly no objection should be made to the completion of a telephone building along the lines originally planned, in order to give efficient and economical service to the subscribers.

5. Some ordinances contain a provision that a building may not be occupied in any part for any purpose until the building is entirely completed. This might be a serious restriction on many desirable activities, and it is important that the ordinance provide for a temporary certificate of partial occupancy in advance of the final completion of a building.

6. A Board of Appeals should be created to hear appeals from the decision of the administrative officer. In other words, there should be a body to which the telephone company may go for relief in case the strict terms of the ordinance would impose an unnecessary or unjust handicap on the telephone service. The experience of zoning experts indicates that a Board of Appeals is most necessary in order that the ordinance may be reasonably applied so as best to promote the public welfare.

7. It is most important that suitable state enabling acts be in force, which make mandatory certain provisions in zoning ordinances enacted under it, compelling proper treatment in any case in connection with which, from the viewpoint of public convenience or welfare, reasonable necessity for any project can be proved to the satisfaction of the Board of Appeals, or Adjustment.

Telephone buildings are intended primarily for the housing of delicate apparatus and the handling of conversations between subscribers, and they will be limited to such use by the telephone company wherever the occasional concurrent use of the same building, or lot, for storehouse, garage, maintenance headquarters, or even commercial offices, is considered unnecessary and objectionable at any particular location. As a matter of fact, such extra use is seldom desired by the telephone company in a residential district; and if such a question ever arose, the company would be willing to have it decided by a Board of Appeals. It desires in every way to be guided as far as practicable by the general provisions of any zoning ordinance adopted for the benefit of any city in which it operates, and its possible objection to any such ordinance will always be restricted to such fundamental service and cost items as, in the opinion of its experts, will unquestionably lead either to the curtailment of its service or to a noticeable increase in the cost thereof.

In conclusion, and to illustrate some of the conditions described, the present Telephone Exchange, in Chicago, Ill., as a whole is divided into 32 office areas, of which only 7 serve more business than residence stations, 3 of these being in the congested Loop area, and the other 4 adjacent thereto. The other 25 offices serve chiefly residence subscribers, as indicated by Fig. 1.

A study of the number and distribution of families in and near Chicago in 1920 and the number and distribution of families which studies indicate for 1940 shows that it will be impossible to locate some 40 central office buildings in Chicago in 1940 and not have many of them in purely residential districts.

Policy in Standardization

Bell Development Engineer Discusses Standardization as Applied to the Telephone Industry — Advantages of Standardization Are Cited and Standardization of Performance Is Favored

By F. L. RHODES*

(Executive Committee Member of American Engineering Standards Committee for Telephone Group)

The telephone industry throughout the world is not universally standardized. Within the United States, which has 6 per cent of the world's population and 63 per cent of the world's telephones, standardization has been a vital factor in the development of the telephone art from the beginning.

In order to obtain a picture of what happens in a telephone system in the absence of standardization, I shall briefly describe some of the conditions that have obtained in the telephone system in Paris, France, until quite recently.

It has been said that in France telephoning is little more than an adventure in a complex of silence and blasphemy. There the telephone subscriber has bought his instruments from some manufacturer. The Government Telephone Administration has approved about one hundred and fifty types of instruments made by about twenty-five different manufacturers. All manufacturers of instruments have done their best to get new types approved, and to sell them to subscribers. From time to time some of these manufacturers have discontinued making certain types; sometimes because it did not pay to make them any longer and sometimes because the manufacturer failed and went out of business. That put the subscriber in a bad position, as frequently he could no longer get any more parts for replacement.

Although the subscriber in France buys his instruments, they are installed by Government employees and the Government maintains them. It has been found difficult to familiarize the inspectors with one hundred and fifty different types and also difficult for maintenance employees to carry all the parts necessary for repairs. When the subscriber has some difficulty with his service, he reports it to the telephone administration and in course of time they send a man to the subscriber's premises to make an inspection. He often reports that the difficulty is not in the Government lines, but that it is in the subscriber's instrument, and perhaps he tries to correct the fault. If he does not succeed, the subscriber is told that he has a bad set and should take it up with the manufacturer. So the subscriber says to the manufacturer, "That set you sold me such and such a day is a bad one. What are you going to do about it?" Then the manufacturer will send someone around to make an examination of the set. He often reports that the difficulty is not in the set at all, but is in the Government line. That sort of correspondence sometimes has passed back and forth two or three times. The result has been a great loss of time to the subscriber and an inconvenience to all other subscribers who want to connect with him.

With so many types of instruments it has been found impossible to establish standards of transmission, so it very often happens that, while one conversation may be good, perhaps the next one is very poor. In the absence of standards of transmission it has not been possible to use the minimum amount of copper in trunk lines.

In the United States this state of affairs has been avoided in the telephone plant by means of standards. The basis of our work of standardization has been that uniform apparatus and methods and materials are desirable for the following reasons:

(1) Standardization makes the best available for all.

(2) Standardization reduces cost because, when all companies use the same things, they can be manufactured in the largest quantities and uniformity in output contributes to economies in production.

(3) Standardization reduces the cost of carrying stocks of materials and the cost of maintenance and repairs, because fewer parts have to be carried.

(4) Standardization reduces the cost of instruction of new employees because there are fewer things to get acquainted with.

(5) Standardization reduces accounting costs because there are fewer types and sizes of materials to keep track of.

(6) Standardization minimizes complicated engineering and operating problems that might result from intercommunication between widely divergent systems and apparatus.

(7) Standardization renders available enormous supplies of materials and labor in emergencies.

(8) Standardization greatly facilitates development work. If everything varied from everything else, there would be no definite point of departure from which to start to improve.

Broad View of Standardization

We have not found it advisable to have merely one standard for each thing and to try to force the business arbitrarily to conform to it. We do have as many standards as varying conditions require. These standards are not static; they are dynamic. We change our standards whenever it is advantageous to do so, and we clearly recognize that special conditions may justify departure from all of them.

Revision of Standards

We are dealing, in the telephone business, with a living organism—a constantly growing thing—and we must, and do, at all times, keep our standards of all kinds under revision to see whether they stand the test that each day applies to them.

Our continuous revision of standards is something more than making verbal changes in the language of specifications or reducing the amount of materials by arbitrary alterations in dimensions or quality. All of our specifications, in the last analysis, are based upon economic considerations or considerations of service.

Relative costs of materials and of different grades of the same materials are subject to change; sometimes more rapidly than at other times, and when the market price of some of those which have been specified becomes excessive, other materials or grades of materials become more economical, if technically satisfactory.

Changing from one material or from one grade of material to another usually involves experimentation and development work, and often requires new inventions. Frequently we find that even a minute change from one dimension to another, as in the case of the thickness of a cable sheath or the thickness of the insulation on a wire, can be made safely only after careful experimentation and preliminary trials, sometimes on an extended scale.

It is always possible to reduce first costs at a sacrifice of service or annual charges. The solution of our problem

**Paper presented at annual meeting of American Engineering Standards Committee, Dec. 11, 1924.*

requires that we make these reductions without such sacrifices. This has been a guiding principle in our standardization work and the results have been of great importance to the public.

In many cases it has been our experience that flexibility of production has been obtained and the path to further improvements kept open by specifying, as far as possible, the performance requirements for completed things. An example of this would be specifying the electrical properties of an insulating compound, such as its insulation resistance, dielectric strength and specific inductive capacity, rather than the percentages and grades of different rubbers, oils, waxes and fillers that may enter into its composition.

There are in existence specifications for some insulating materials which rigidly specify composition. From our contact with manufacturers we have found a general opinion to exist that these requirements are not the best that could have been devised, from the standpoints of cost, electrical properties or durability, and that such requirements may be fully complied with and yet inferior material produced.

Under the plan of specifying results, we have had a number of manufacturers preparing wires under the same specifications. No two of these manufacturers are employing the same insulating compounds in the same proportions, and yet, after a number of years' experience with each of them, we are unable to point out one of these compounds as being distinctly better than the others. This feature has its advantages from the standpoint of diversifying the raw material demand. Thus during the war period one of our manufacturers was inconvenienced by being unable to obtain from his accustomed source of supply the principal mineral filler used in his insulating compound. Our supervisory tests indicated that his product was failing to meet specification requirements and inspections at his plant were temporarily discontinued. Meanwhile other suppliers, not so handicapped, were proceeding normally.

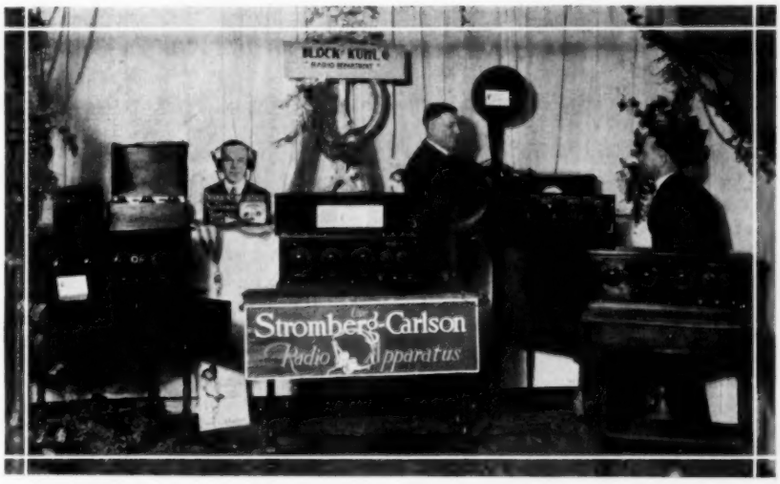
The specifying of composition in such materials as rubber insulating compounds is also a deterrent to the manufacturer in his desire to improve his own product. Recently the manufacturer whose research facilities along his own line are very complete, gave us the results of tests involving the preparation of several hundred samples of a special wire. In this case, working along parallel lines, we had already arrived at a solution of the problem which showed some advantages over this manufacturer's proposal. Such cooperation, however, deserves the purchaser's encouragement and an effective way of extending it is the drafting of specifications in such a way that improvements of mutual advantage may be most readily developed.

In specifications for hardware we depend upon such mechanical tests as can be made by the inspector in connection with his examination for dimensions and assembly details. We have operated on the basis of omitting composition requirements for a number of years and have found it desirable to resort to analyses in only a few cases where isolated failures have made thorough investigation of the failing pieces necessary.

There are, of course, some materials to which tests to determine suitability are not as readily applied, as to those referred to above. Typical of these materials are paints and timber preservatives. But even for these materials we have found it practicable to eliminate all but a few fundamental composition requirements. Thus we have purchased paint in large quantities without specifying the composition of the pigment, depending upon color, fineness and insolubility to indicate acceptable characteristics. Under this arrangement the chemical tests resolve themselves into a fairly simple determination of the purity of the vehicle.

In closing, I should like to emphasize the disadvantages in allowing standards to become so crystallized and set that their revision becomes a difficult and time-consuming process. Standardization is a useful servant but a bad master. If improperly used, in a rigid, uncompromising way, standardization may fetter progress. If properly used, standardization will be found to be a valuable aid to progress. Whether standardization becomes a hindrance or an aid to progress will, in my opinion, largely depend upon the degree of flexibility of standards that is maintained, which involves a working arrangement so set up as to facilitate revision, and the full utilization of this arrangement by making revisions whenever this can advantageously be done.

Paul Meyers, Ringmaster of S-C Radio Show



Stromberg-Carlson radio equipment was shown at the recent Peoria (Ill.) Radio Show, with Paul Meyers, Illinois representative for the S-C company, acting as master of ceremonies.

The showing was made by the Block and Kuhl company, Stromberg-Carlson's Peoria distributors. Meyers is the handsome gentleman shown in the photograph between the two other loud, clear speakers of the S-C line. The equipment shown, reading from left to right, is the Stromberg-Carlson No. 2-A Console type Radio Receiver; the Stromberg-Carlson No. 1-A Radio Receiver; the Stromberg-Carlson No. 1-A Loud Speaker; the Apparatus Assembly of the Stromberg-Carlson Receiver, and the Stromberg-Carlson No. 1-A Receiver mounted on a table.

Sherman Employes Have Unique Home Building Plan

Sherman, Tex.—An interesting plan of co-operative effort to secure homes for employes of the Grayson Telephone company, at a saving of about $1,000 on each home built, has resulted in three homes being constructed and two additional ones started. The homes are located on adjoining lots on Kessler boulevard, a new street recently opened under the Kessler plan.

The homes are being built by the combined efforts of fellow employes of the telephone company, with the aid of skilled mechanics for the plumbing and brick work only.

Chicago, Ill.—A head writer on the Chicago Post is responsible for introducing a new and snappy term for telephone operators into the English language as it is spoken. In putting a head on an Illinois convention Associated Press story, the scribe wrote, "Fair Plug Jugglers to Explain Troubles."

Lessons from "Dear" Teacher

Experience With Recent Record-Breaking Storm Points Out Some Important Construction Features to Prominent Telephone Man Who Makes Post-Mortem

By P. KERR HIGGINS

St. Louis, Mo.—On December 18th and 19th, the eastern central portion of Missouri and the western central portion of Illinois were struck by one of the worst sleet storms it has experienced in the past forty years. With rain freezing as fast is it came down, St. Louis and the surrounding territory were fast in the grips of the elements. It would appear that a rain storm coming from the southwest and a severe cold wave coming from the northwest met in this territory and that a sleet storm was the result. Practically every electric line was put out of commission in a very few hours and an S O S was broadcasted over the country for linemen, material and tools, with the result that over a thousand men were imported and working within twenty-four hours in the stricken area. The writer drove over about six hundred miles of pole lines which had been more or less destroyed, some of them completely. Pictures of the damage were almost out of the question as miles and miles of the line were laid completely flat on the ground in a tangled mass. While the larger companies sustained a loss of over a million dollars, estimated, no estimate can be made at this time of the loss to the smaller independent companies, some of whom were completely wiped out, not even the office pole being left standing. About 3,000 telephones were out of commission in St. Louis.

The Telephone Service Bureau, operating fifteen small exchanges in the stricken zone, will sustain a loss of probably $50,000. Three exchanges were completely shut down at Mehlville, Affton and Fenton, St. Louis County, Missouri, as the damage was so great that it will take months to rebuild them. About a dozen small mutual exchanges in Miller county were completely put out of business. Zero weather has existed in this territory almost continuously since the storm and this has greatly hampered the work of rebuilding and increased the cost of same.

In going over the devastated area, the writer took pains to carefully examine the damage done to the lines in an effort to draw some conclusions and learn some lessons which might be beneficial in the future. One could not help but realize that "no chain is stronger than its weakest link," or in telephone parlance no telephone pole line is stronger than its weakest pole. An examination of the poles which were broken off at the ground line showed that about eighty per cent were butt-rotted, the balance having been not set deep enough tore up the ground and fell over with the extra weight. About ten per cent of the poles were broken above ground and apparently caused by the heavy load placed upon them by the breaking of the weaker poles.

In almost all cases where poles were left standing, they were either extra good stout poles or well raked against the strain of the line, or had line guys fastened to them. It would therefore seem from my observations that if a disaster of this kind is to be avoided in the future, more line and head guying should be used, also shorter and stouter poles. It was also observed that in many cases the bad breaks were directly traceable to insufficient trimming of the right of way, as large branches weighted down by the ice and in many cases whole trees fell down over the leads. It would also appear that on heavy leads it may be necessary in future to shorten up the spans. In the rural districts it was noted that many wires broke on account of poor splicing and permitted the pole lines to go over. There were also many breaks directly traceable to badly built corners and poorly aligned poles. It is also suggested that in placing line and head guys, they should be placed in alternate or both directions.

There is a splendid opportunity for experiment in our telephone laboratories to find some suitable coating for line wires to which sleet would not adhere. Whether this is possible or practical, the writer does not know, but merely throws out the suggestion.

A systematic inspection of pole lines such as is carried on by the A. T. and T. Company might have prevented this disaster. But the lead of fine poles on Saint Charles Road went down to defeat like the rest.

On a pole line nearly six miles long and passing through a small village in St. Louis County, Missouri, there was a section of about 20 poles where it had been the intention to erect cables, but never completed, possibly all of this line was on the ground, but this section remained intact, seemingly due to the down pressure of the messenger strand and guys at each end. Lead was 16 years old.

In several leads I noticed a mixture of white cedar and native oak pole, averaging 22 inches. There were some of these almost new. The cedar broke with the weight, while the native oak (new) only bent over, in many cases from three to four feet of earth.

In Eldon, Missouri, about 80 per cent of the plant was in buried cable. This remains intact. No trouble, except a few drops broken, while the open plant went down. This exchange is only typical of others when this condition existed, such as in Festus and Marble Hills. Buried cable has been tabooed by many engineers, but it saved the day in this storm.

We are all wondering what the small mutual farmer exchanges will do. No men and less money. In the stricken area almost all of these exchanges were wiped out, not even the office poles left standing.

In the Lincoln, Neb., district the storm damage was estimated at $250,000. In one county of the Lincoln Telephone and Telegraph territory approximately 1,500 poles fell under the storm strain. Two storms, a few days apart, the second one the more serious of the two, wrought demoralization of telephone service that large forces of repairmen made desperate efforts to end.

Total damage to the Northwestern Bell's lines in Nebraska and Iowa was set over the $500,000 mark. More than 5,000 poles of the Northwestern's lines were down in Nebraska and the number of poles toppled by the storm in Iowa is larger than the Nebraska total. It is said that 100,000 miles of wire was put out of service by the storm.

Emergency repair crews from Colorado, Kansas, Missouri and Minnesota were rushed into Northwestern territory, so the company was able to put into action more than 750 men in rehabilitation work. These repair crews had one of the toughest jobs of their careers. Deep snow drifts in Nebraska and slippery roads in Iowa made it practically impossible to employ motor trucks. In some cases the repairmen could not get through the snow drifts even on horseback and were compelled to crawl from pole to pole on their hands and knees.

One of the mitigating features of the storm was the way in which the newspapers in the territory affected treated the telephone companies. The Manchester, Iowa, Democrat, in writing of the $10,000 storm damage suffered by the Delaware County Tele-

phone company, told its readers: "If your telephone service is not what it should be, just kindly bear in mind that a large force of men is working out doors in this intensely cold weather, doing all in its power to restore the service we so much appreciate."

At Taylorville, Ill., it was estimated that more than 1,500 lines were out of service in the city, and possibly 2,500 in the county. Local reports tell of one four-mile stretch where only six poles were left standing.

The report at Decatur indicated that the cost of repairing in that district of Illinois would be $200,000. The cost of repairing the Decatur-Bloomington line is estimated as at least $75,000. Approximately 3,300 poles were laid low by the storm in that district.

Parts of Michigan, too, were hard hit. The Rollin (Mich.) Telephone company stated, following the storm, that it would be weeks, if not months, before normal service could be renewed.

Smaller exchanges in many cases were about wiped out so far as the outside plants were concerned, and it took all of the resourcefulness and capacity for absorbing punishment that the managements could muster to get lines back into working order in the remarkably short space of time that it took for the accomplishment of this terrifying task.

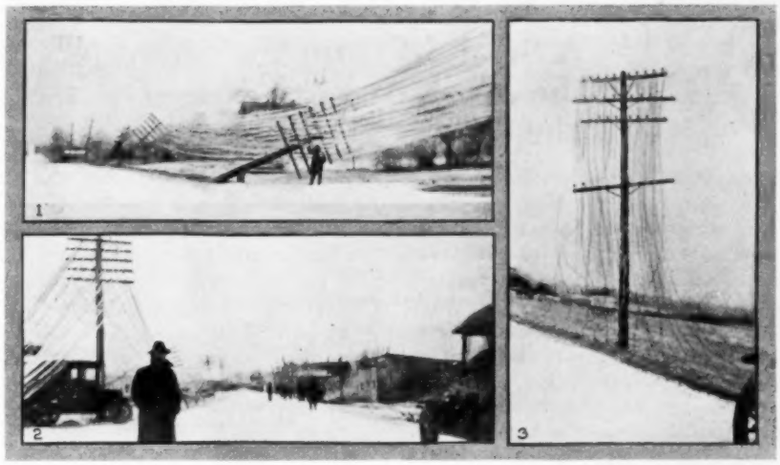
The exchanges of P. Kerr Higgins' in St. Louis county, Mo., were among those that suffered in a way typical of the smaller plants in the storm area. Three of the Higgins plants, those at Mehlville, Affton, and Fenton were completely destroyed by sleet.

Storm Booms Supply Sales Says Al Johnson

Chicago, Ill.—December's record storm brought with it the proverbial not altogether ill wind blowing someone some good, according to Al. J. Johnson, manufacturers' representative for a number of makers of telephone supplies. On the first morning after the storm there was a deluge of wires filtered through the choked communication channels, and letters came in bundles, all with orders for supplies. The storm had a two-fold benefit, in making practically an extra month's business for the manufacturers, and in supplying the necessity for many telephone companies to put through the improved construction plans that had been contemplated for some time.

"Work of construction crews in erecting permanent lines despite the hardships and handicaps of the storm was nothing short of miraculous," says Mr. Johnson, who has been in close touch with the storm-swept area. "Managements have tackled the serious financing problems in a way that promises a fairly early relief," Mr. Johnson also commented.

Why Higgins' Series Is Delayed



Here are some of the sights that P. Kerr Higgins, president of the Telephone Service Bureau of St. Louis, saw when he looked over the lines around St. Louis following the disastrous December storm.

Upper left—Some of the misery near Fenton, Mo. Lower left—Repair gangs at work near Sappington, Mo. Mr. Higgins is in the foreground. At the right—The only pole standing in 10 miles near Mehlville, Mo.

Now is it necessary to explain why the Higgins' series of articles which has proved such a popular, practical feature in TELEPHONE ENGINEER, will not appear in the January issue?

In this issue, however, there are a few lessons of the storm pointed out by Mr. Higgins, and his series will be continued in the February issue after the author has had a chance to clear away his grief.

Storm Brings Higher Rate Pleas

Springfield, Ill.—Authority to issue emergency bonds and increase rates to provide money for repair of damage from the ice storm which struck Illinois Dec. 17 was asked in an application filed with the Illinois Commerce Commission by 157 telephone companies operating in the state. A hearing on the application was begun at once.

The application asked permission to issue 6 per cent twenty-year bonds sufficient to repair damage. No figures on the amount necessary were given.

Authority also was asked to increase rates enough to amortize the principal and pay interest on the bonds, the increase not to exceed an average of 5 cents per month per station.

Practically every telephone company with lines south of Kankakee and north of Carlinville joined in the application, including the Illinois Bell Telephone Company, the Effingham County Telephone Company, the Hoopeston Telephone Company, the Vermilion County Telephone Company, the Southwestern Bell Telephone Company, the Streator Telephone Company, the Marseilles Telephone Company and the Illinois Southern Telephone Company.

The practical series of construction helps written by P. Kerr Higgins will be resumed in the next issue of TELEPHONE ENGINEER with an article on buried cable.

Youngstown, Ohio.—Truscon steel poles now are being made of copper-bearing steel. This material is rust-resisting.

Take a Look at Yourself

A Straight from the Shoulder Talk on Making the Most of Your Job—By a Man Who from the Ranks Has Fought His Way to the Top

By "PLANT MANAGER"

A long time ago, as the fairy tales start—only this is no fairy tale—a close friend of mine had a fine colt which he had almost raised by hand. Frank, as he was called, was a perfect specimen of horseflesh. At the age of 3 years he was broken to harness and gave promise of being all one could want in the way of a good driver.

But alas, Frank did not appreciate good treatment and his owner, who was getting old, soon found that he had a job handling the horse when hitched to a buggy. Frank would jog along as nice as any horse, when all at once he'd take a notion to whirl and run or would try to kick the dashboard out of the buggy. Finally the old gentleman found that a two wheeled cart was the safest thing to drive in as Frank simply would not behave. That horse would shy, run or whirl when anything would appear suddenly before him or another horse try to pass.

As kind treatment availed nothing, whipping was tried, but it was no use, that horse did not know the meaning of behavior. Finally after almost killing his owner, he was sold to a liveryman who tried to make a dependable animal out of him. The liveryman had no better luck so traded Frank to some gypsies. They broke the horse of some of the bad habits, but also broke his high spirits, and he was practically worthless.

Another friend had a cow named Spot. She was part Jersey and part Holstein, and she gave more milk than any other cow on the farm. But, "Oh Boy," how she could kick. She'd give a big bucket of milk, and if not closely watched would either step in it or kick it over. She was well treated but was a dangerous animal to handle. It mattered not whether Spot was kindly treated or punished she got worse and finally before being milked, she had to be driven into a narrow stall, have a yoke put over her head and her legs fastened so she could not kick.

This performance finally became monotonous and Spot was sold to the butcher. I almost imagine that anyone who bought some of that steak had to weight it down in the pan to keep it from kicking out.

No doubt, by this time, you are wondering whether you are reading a farm journal, or a telephone magazine, and what the foregoing has to do with the telephone business. Scratch your head and think if you know any Franks or Spots in your or any other organization. How about yourself?

Some years ago the AB Telephone Company needed a man for a more or less responsible position; one that required tact and common sense. After so long a time a man who had been employed as switchboard man for some time for another company was hired. This man had displayed a good technical education in his correspondence and was thought to be the man for the job. Very often in his letters he would bring in his relations with his company, complaining of being mistreated and imposed upon and wanted to make a change.

The AB Company hired him and for a time everything was lovely, John was filling the bill, was treated right, and had everything his own way. One day he was asked to do something a little out of line with the work he had been doing, but which was specified, in the beginning, might be a part of his work. He plainly showed he did not like to be taken off the beaten path. His main work was to keep the switchboard, power and other central office equipment in first class condition. He was also told that he would be expected to do other work, should occasion require, and he had the time. This part of his original agreement he evidently forgot, as he always grouched and chewed the rag about doing more than he was paid for, although he was paid a good salary when hired, and had received some increase since. He would get mad when the chief operator or any other operator asked him to repair something needing attention, and would inform them that the trouble should be reported to the wire-chiefs as he, John, wasn't taking orders from everybody. Several times the wire-chief talked to John, asking him to look after things without so much fussing and to be more cheerful as he was getting a square deal. But talks and explanations did no good, John thought he could do as he pleased when he pleased and that the company had to keep him.

To make a long story short, John, like the horse, kicked and run once too often, and was very much surprised when told that his services were no longer needed.

How about you, brother? Do you think you have such a cinch on your job that you can kick over the traces every time your employer makes a suggestion, asks you to do something a little out of your line or gives you a deserved calldown? If you feel and act that way, you'd better wake up or some day you'll be going down the road talking to yourself and wondering how it happened.

Just recently I was told of an old friend who is with a fairly large company that did think a lot of his capabilities. This man understands his business but is developing a very bad disposition. When a subscriber asks for better service or wants to know when he can have his phone moved, Bill answers in a very curt manner, "There's nothing wrong with your service, you're getting as much as you're paying for" or something like that. Regarding the move, "Don't be in a hurry, we have a lot more people who want things done and we can't take care of all of you at once." Bill has also gotten the idea into his head that he is the only one on the plant that knows anything and he is not going to allow any one else to learn as much as he knows. When one of the boys suggests a good thing, Bill sees to it that the big boss believes it to be his, Bill's, idea. Consequently the men under him are becoming dissatisfied and they cannot be blamed for being so. If I have been informed correctly, Bill is due to be canned before the price of sugar goes higher.

Let me tell you, friend, don't think you're the whole works. Give the other fellow a chance. When you get to the point where you think your employer cannot get along without you, you are only kidding yourself. Don't try to run away or kick over the bucket of milk. Help your helpers and your work will be a lot easier. The Kaiser thought he could run the whole world, but now he's wondering

how it happened and the world is going around somewhat better than it used to.

Suppose tomorrow you were to take a new job. How would you go about it? Will you say to the other fellow, "I'm boss now, what I say goes." Hardly that, if you've got common sense. You'll say something like this, "Come into the office, fellows, let's talk this job over and see if we can all pull together and make a success of the plant. I have been given charge of the work and if you'll help me, I'll help you and we'll make a good plant and have good jobs. This is not a one man plant, it will take all of us to make it go. What you can do to benefit the company will no doubt help you. Bring in all your troubles and problems, let's talk them over and see what is wrong. But whatever you do, don't be a Frank or Spot."

No doubt some of you fellows hold responsible positions and are doing all you can for the good of your employer. Maybe some of you class yourselves as only a troubleman or just a lineman, forgetting your job as soon as quitting time comes or perhaps sooner if you think you can get away with it. If that's your feeling, you'll never be anything else. If you think your responsibility ends when you lay your tools down, don't expect to be promoted much higher. You've gone about as high as you'll go. Just the other day a lineman said to me, "See that fellow coming there? Well, he and I climbed poles together twenty years ago. He's boss now." Well, said I, "What's the matter, George, he beat you out? Said George, "He had sense enough to see ahead and worked for a better job, I was a d——n fool." Think it over boys. Does it pay to kill time and be in George's class? When you kill time during working hours, you are stealing just the same as if you put your hand into the cash drawer and took money that did not belong to you.

If any of you readers are beginners just take a little advice from one who has been through the mill. He's not all the way through yet. Now you fellows who know all about the business need not read the following paragraph; it won't do you any good and you'll say, "That guy's just handing out a lot of bull." Talking about bull, I've had a lot of it handed to me and will probably get more as I'm pretty easy, but I have tried to attend to business.

Friend beginner, when you took that job, no doubt you thought you would soon know all about a telephone and its numerous relatives. That's right, keep on thinking it and everlastingly working at it and you may some day land a good job. Say boy, if you once get real interested, you'll sometimes forget to eat and you'll sit up nights trying to make the darn thing work. Talk about the wireless bugs! Humph, they haven't got anything on the telephone bug when he once stings you. Say, you can have more fun trying to make some complicated circuit work or figuring out a construction problem than you can at a Toonerville Trolley picture show. Maybe you'll cuss a little, but stay with it and you'll find a way out.

When you take a job, make up your mind to give it the best there is in you. Don't listen to the fellow who says, "you ain't gettin' paid fer that, I wouldn't do it," or, "What's the use to hurry, to-morrow's comin'," or, "It's quitten time, let's beat it, you don't git nothin' outen worken overtime," or, "That's good enough nobody'll ever see it," or a lot of other things along those lines. Again I say, don't pay any attention to that bird, he'll only get you in bad.

I know there will be a lot of times when things go wrong and you will think your employer is not treating you right. There will be many mean cases of trouble to clear and other disagreeable jobs to do, but no matter what line of work you take up, you'll find it is not a bed of roses. Just remember that if we never had a storm we could not properly appreciate the sunshine. Nothing worth while comes easy.

When you get up in the morning, make up your mind to go to work cheerfully; keep at it that way all day and you will be surprised how pleasant it is. If some irate subscriber gets unreasonable in his complaints, take time to explain conditions and do what you can to make his service good. Never use rough or insolent language to a subscriber and you will find you will make many friends who will welcome you with a smile.

Be gentlemanly in your actions and conversations with the operators. Always be ready to defend them as many subscribers accuse operators of many things they do not do. Should you be employed in the switchboard department, do your part in keeping the board in good condition. Do not let a lot of ragged cords accumulate or let the jacks or plugs become dirty. Have repair parts placed in such a manner that you can easily get them and see to it that the stock does not run low enough to hold up needed repairs while you wait on a stock of supplies.

You will find that some operators are a little hard to please. They, like the subscribers, have imaginary troubles. Study the girls, learn their dispositions, likes and dislikes, and you will find them a mighty fine bunch of folks to work with. There are many little favors you can do for the chief and her girls. Do them and you will be well repaid for your trouble.

If you are a wire-chief's helper or test man, study the complaints and make suggestions to your superiors as to what should be done to eliminate or cut down certain kinds of troubles. Be prompt and courteous in your treatment of subscribers. Do not give a subscriber reason to feel that his complaint is being neglected or that he is being mistreated. Many times you will feel like going out and punching somebody in the eye or tell them what you think, but you must not let the subscriber know you feel that way. Your duty is to do all you can to give the subscriber what he pays for and is entitled to.

Many times you will no doubt be asked by your superiors, why is this, that or the other thing as it is. Keep your work in hand so that you can give promptly the information wanted. Do not become peeved at these questions; those asking them have a right to know and should be given prompt and courteous answers.

You may be responsible for certain work in parts of the plant, so if things do not go right in your department do not pass the buck onto some one else. If you are fair and assume your own responsibilities you will find, no doubt, that your employer will be fair with you.

No matter where or in what department you make your start, make up your mind to be honest with your employer and yourself. Do everything asked of you and anything else you can do to make good service and you will no doubt be given a square deal, both in working conditions and salary. If you cannot do that, you are working an injustice to yourself as well as to your employer and associates. As long as you are on the job, work as hard for the small salary as you would for a larger one. If you think you have not been given a square deal, for the sake of yourself and employer, quit kidding, find where the trouble is, and remedy it.

Above all, don't be a Frank or a Spot.

Philadelphia, Pa.—Approximately $31,000,000 will be spent by the Bell Telephone company of Pennsylvania in plant extensions during 1925.

Our Literary Digest

Review of Recent Publications on Telephony and Allied Subjects

Practices in Telephone Transmission Maintenance Work, by W. H. Harden, Journal of American Institute of Electrical Engineers, Dec. 1924.

This paper deals with the methods of measuring transmission efficiency of telephone circuits, as applied in maintaining the circuits to a predetermined standard of efficiency. In general, toll circuits may be divided into three classes: non-repeatered circuits, circuits with repeaters and circuits equipped for carrier-current transmission. Tests are made through the toll switchboard by means of the transmission measuring sets that have been described in other papers. Non-repeatered circuits, usually, are tested by looping two circuits at the distant switchboard, while repeatered circuits and carrier channels require testing equipment at each terminal, and tests in each direction, separately. Between 40 and 50 permanently installed transmission testing sets now are used in the Bell long distance system.

In exchange areas, routine transmission testing presents somewhat different problems. In general, portable transmission testing sets are used and the loop method of testing is employed. In machine switching offices, special provisions are made for connecting the set to the circuit which is to be tested. It is common practice in the Bell System to have each office tested at definite intervals, and the work is done by men who travel from office to office. Two men with a light automobile constitute a transmission testing team. From two to four weeks is required for a complete transmission test of a 10,000 line office, exclusive of subscribers' lines.

Telephone Circuit Unbalances, Determination of Magnitude and Location, by L. P. Ferris and R. G. McCurdy, Journal of American Institute of Electrical Engineers, Dec. 1924.

Noise in telephone circuits may arise from dissymetry of the two sides in relation to inducing circuits, or from dissymetry of the two sides in relation to ground or other telephone conductors. Unbalances in telephone circuits are called self-unbalance when only the conductors of the circuit and ground are involved and mutual-unbalance when other conductors are involved. Self unbalances may occur, due to accidental conditions on the line. Mutual unbalances may be caused by transposition errors. In practice, it is not possible to measure the effects of the two types of unbalance, separately. After a discussion of methods of energizing circuits and of terminating circuits for testing, the various types of testing circuits for unbalances are described. The cross talk set is used to determine if the unbalance exceeds a certain amount. When the unbalance exceeds the allowable limit, an impedance unbalance bridge is used to obtain an approximate location. Measurements are made at a number of frequencies and resistance and impedance unbalances are plotted as functions of frequency. From the curves obtained may be determined the location of the unbalance. It, usually, is possible to locate a single unbalance or one large in respect to other unbalances, within one or two 8-mile transposition sections. An unbalance detector set then is used which will show, definitely, whether the unbalance is between the sending and receiving elements of the detector set. Special methods of locating unbalances in office equipment, particularly in composite telegraph equipment, also are described.

Carolinas Organize

C. P. McCluer Made First Head of New Southern Telephone Association.

Charlotte, N. C.—Representatives of the leading telephone companies in North and South Carolina met here for the organization of the Carolinas Telephone association. At the first meeting of the infant association the following officers were elected:

President, C. P. McCluer, general manager, Carolina Telephone & Telegraph Co., Tarboro, N. C.

Vice-President for North Carolina, J. F. Hayden, general manager, North State Telephone Co., High Point, N. C.

Vice-President for South Carolina, J. W. Sproles, general manager, Greenwood Telephone Co., Greenwood, S. C.

Secretary-Treasurer, J. R. Porter, general manager, Home Telephone & Telegraph Co., Henderson, N. C.

A number of nationally known telephone men were featured on the program, leading telephone equipment and supply manufacturers exhibited and a Pioneer initiation staged by H. E. Bradley and J. K. Johnson gave the Carolinas' debut a mature aspect.

F. B. McKinnon spoke on the benefits of concerted action on the part of the 233 Independent and 81 Bell units in North Carolina and the 55 Bell and 115 Independent factors in South Carolina, during the opening session of the meeting. J. W. Coffey, the telephone accounting expert, H. C. Tucker, manager of the Sumter, S. C., Telephone company, and Frank W. Shealy, chairman of the Railroad Commission of South Carolina, were other headliners on the opening day's program.

Relationship between Bell and Independent companies was the subject of the remarks made by Morgan B. Speir, Carolina's general manager for the Southern Bell. James N. Cox of Gainesboro spoke on "Standard Charges for Telephone Service." An address on the benefits of association work was made by E. L. Barnes, president of the Rock Hill, S. C., company.

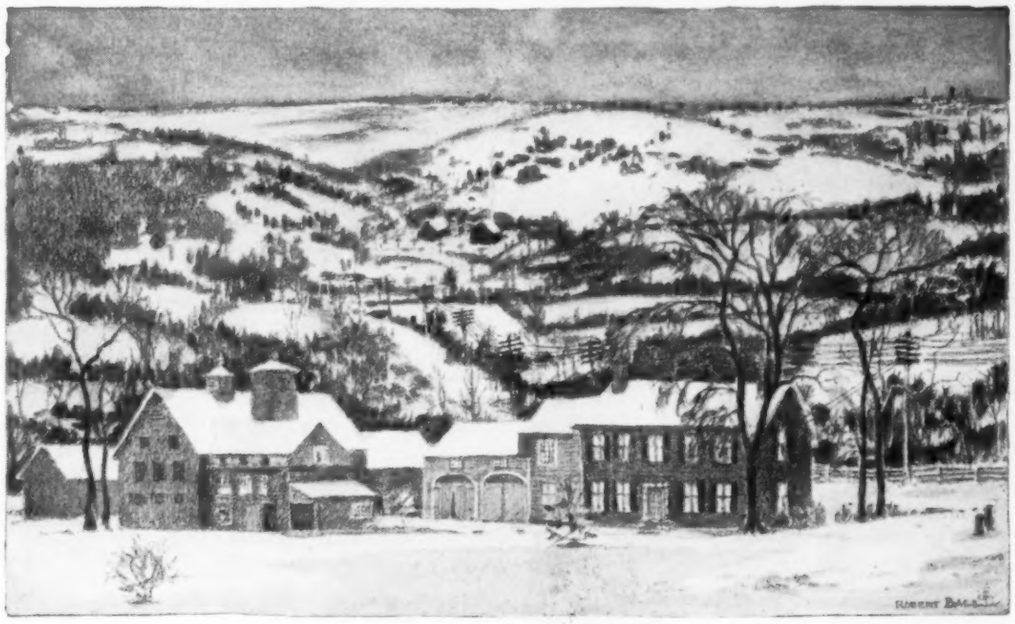
California's Two-Day Meet Pays Its Own Way

Whittier, Cal.—The two-day meeting of the California Independent Telephone association held here in December was one of the most valuable sessions the Golden State body ever held in practical value to its members, so those in attendance agreed.

President Rolfe's tabulation of the earnings, expenses and outstanding securities of California Independents and comparative figures on these items as related to the average for the entire United States, were shown for the first time at a general session.

Plant work occupied considerable of the association's attention. The standardization of construction methods and materials which was codified by Secretary Ernest Irwin following the successful district meetings of plant men held earlier by the association, was discussed. The matter of obtaining suggestions from the organization's members on the California commission's overhead line construction order also was gone into at length.

Fred C. Mendeck of Whittier spoke of the importance of the plant crew reports in assuring correct telephone company accounting. "Necessity of Accounting Records for Small Companies" was the subject of the address made by J. S. Campbell, manager of the Corona (Cal.) company.



NEIGHBORS

When Ephraim Crosby made a clearing far out on Valley Road and built his house, he had no neighbors. He lived an independent life, producing on the farm practically all that his family ate and wore. Emergencies—sickness and fire and protection of his homestead from prowlers—he met for himself. Later he had neighbors, one five and another eight miles away. Sometimes he helped them with their planting and harvesting, and they helped him in turn. Produce was marketed in the town, twenty miles along the cart-road.

Today Ephraim Crosby's grandchildren still live in the homestead, farming its many acres. The next house is a good mile away. But the Crosbys of today are not isolated. They neighbor with a nation. They buy and sell in the far city as well as in the county-seat. They have at their call the assistance and services of men in Chicago or New York, as well as men on the next farm.

Stretching from the Crosbys' farm living-room are telephone wires that lead to every part of the nation. Though they live in the distant countryside, the Crosbys enjoy the benefits of national telephone service as wholly as does the city dweller. The plan and organization of the Bell System has extended the facilities of the telephone to all types of people. By producing a telephone service superior to any in the world at a cost within the reach of all to pay, the Bell System has made America a nation of neighbors.

AMERICAN TELEPHONE AND TELEGRAPH COMPANY
AND ASSOCIATED COMPANIES
BELL SYSTEM
One Policy, One System, Universal Service

Radio, Instead of Rest, Lot of Shinmyo, Tokyo Phone Chief

Chicago, Ill.—N. Shinmyo, who headed the telephone reconstruction of Japan following the earthquake, instead of retiring after 30 years' service in the Japanese Department of Communications, has accepted the position of managing director of the Tokyo Radio Broadcasting company.

Mr. Shinmyo, whose contacts with his many friends in the United States are maintained with some interesting correspondence, writes TELEPHONE ENGINEER of his recently revised plans, as follows:

"The Tokyo Central Telephone Office which lost 16 out of its 20 exchanges in the earthquake, has since added 6 exchanges to its escaping four. At present 10 offices are in active service, accommodating 80 per cent of prequake subscribers. These all belong to manual system, but 10 exchanges to be installed in near future will be all those of automatic. The management has completed the necessary arrangement and is waiting only the arrival of the equipment from abroad, which is expected next March.

"The telephone reconstruction has thus been brought almost to completion, and I hoped to spend a year or so at a quiet seaside for my health's sake. Thus with last month I have retired from the service in the Department of Communications where I have been for more than 30 years. I have hitherto never been in other work.

"While I was busy preparing to go to the seaside, Viscount Goto, ex-Home Minister, ex-Mayor of Tokyo and one of the greatest statesmen Japan has ever given birth to, overhearing that there was the intention of my resignation, has been very kind to offer me through Mr. Inukai, Minister of Communications, and Mr. Kuwayama, Vice Minister of the Department, the position of managing director in the nascent Tokyo Radio Broadcasting company, over which his excellency is to be president.

"Man is ready to die for the one who fully trusts him" is an old proverb of ours. I could not but accept the kind proposal made by such a big personage as his excellency with all my heart. I am therefore busy working for the new institution just under way.

"It is the first experience for Japan to have radio broadcasting on such a large scale, and especially under a official character like this. Japan is also going to have another such a concern in Osaka. Tokyo will have radio station opened some time next April, and we are busily engaged for the preparation. Ours will be a 1½ Watt station operating on 375 meters. This will be known as JOAK in the radio world.

"It was only the other day's occurrence that we were able to distinctly and clearly hear a message broadcast by the KGO (San Francisco) all the way across the Pacific Ocean. With the further improvement and development of the science, as well as the apparatus, nations of the whole world would, I believe, be neighbors in the real sense of the word."

Lloyd B. Wilson, Omaha, New Bell Commercial Head

Omaha, Neb.—Lloyd B. Wilson, general commercial superintendent of the Northwestern Bell Telephone company, on January 1, 1925, becomes commercial engineer for the American Telephone & Telegraph company, with headquarters in New York. Mr. Wilson succeeds C. O. Bickelhaupt, who goes to be vice president and general manager of the Southern Bell Telephone company.

Lloyd C. Wilson, successor to C. O. Bickelhaupt as Bell General Commercial Engineer.

Mr. Wilson was born May 27, 1883, at Plattsmouth, Neb., and in 1899, while attending high school, entered telephone work as a night operator with the pay of $15 a month. When he was graduated from school, he continued his work as night operator and in addition became voluntary assistant to the manager in installing telephones, digging holes, and climbing poles during the day in order to learn more about the business.

Mr. Wilson says that he made up his mind early in life to stick with telephone work and he let no outside offers deviate him from his ambition. He was offered better pay at Plattsmouth in other positions, but declined the offers. In 1901 he went to Lincoln as an inspector's helper at $20 a month and in five months was made inspector.

He realized his ambition to be manager in 1903, in the village of Central City, an exchange with 150 subscribers. In 1909 he was made district commercial manager at Grand Island, in 1913 division superintendent at Omaha, in 1917 Minnesota division commercial superintendent in Minneapolis, and in 1919 he became general commercial superintendent for the Northwestern Bell Telephone company, with offices in Omaha. He celebrated his twenty-fifth service anniversary July 1, 1924.

Lillian A. Vavasour, Traffic Expert, Appendicitis Victim

Albany, N. Y.—Miss Lillian A. Vavasour, chief traffic inspector for the Friendship (N. Y.) Telephone company, and prominent in state and national telephone association traffic work, died in a local hospital on December 5, following an appendicitis operation on December 1.

Miss Vavasour entered telephone work as an operator in 1906 at Albany, immediately following her graduation from high school. For 12 years she was traveling traffic inspector for the New York Public Service commission. She was one of the three women who prepared the text for the Toll Reference text book recently published by the United States Independent Telephone association.

Bickelhaupt, Young Engineer, Goes to Southern Bell

Atlanta, Ga.—C. O. Bickelhaupt, of New York City, general commercial engineer of the American Telephone & Telegraph Company, has been appointed vice-president in charge of operation of the southern group of Bell Telephone companies.

Although he is said to be one of the youngest operating vice-presidents in the Bell System, Mr. Bickelhaupt has had a long and varied experience in the telephone business.

Mt. Vernon, O.—Edward O. Arnold, until a few years ago business manager of the Mt. Vernon Telephone Co., died here December 15. He was one of the company's founders and was vice president and treasurer of the company at the time of his death.

UNIVERSAL MAP DISPLAYORS

SOLVE THE PROBLEM OF VISUALIZING MAPS WITHOUT INCONVENIENCE OF STOOPING, REACHING OR TAKING UP LARGE SPACE

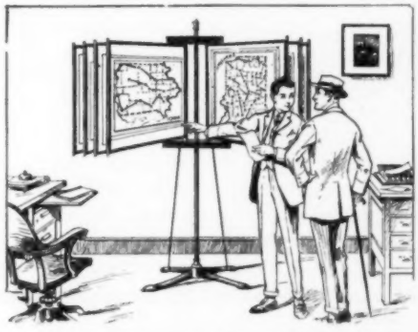
For Maps, Charts, Diagrams, Photos, Distribution Maps, Blue Prints, Progress Charts, Transmission Systems, Advertising Copy, Graphic Records and the many other items that enter into an executive's duties. By thumbtacking or mounting your subject matter on the swinging wings of "UNIVERSAL" DISPLAYORS, you have an instant picture of your problem easily accessible.

"UNIVERSAL" WALL PIVOT DISPLAYOR
Readily fastened to wall, post or partition. 2 Models, 6 and 10 wings. Wings quickly removed and replaced. Wing sizes 20x30", 29x29"; 24x36", 30x40".

"UNIVERSAL" SQUARE END DISPLAYOR
Stands independent on floor. Furnished any size from 12 to 25 wings. Wing sizes, 20x30", 29x29", 24x36", 30x40", 24x52".

The wings are made of rigid steel frame, electrically welded, with thumbtack board fillers covered with finest green Dundee burlap or mounted with green paper to give smooth writing surface. Other types and larger units besides those illustrated here. Many wing sizes: a few are 20x30", 24x36", 30x40", 26x45", 48x60", 50x48", etc., etc.

In use for years in numerous offices of A. T. & T. Co., New York Telephone Co., Bell Telephone Co. of Pa., other Bell Companies, Western Union Telegraph Co., Postal Telegraph & Cable Co., Western Electric Co., General Electric Co., Westinghouse Electric & Mfg. Co., Westinghouse Lamp Co., New York Edison Co., Brooklyn Edison Co., Philadelphia Electric Co., Detroit Edison Co., Consolidated Gas & Electric Co., Baltimore, Pennsylvania Power & Light Co., various domestic and Latin American properties of the Electric Bond and Share Co., etc.



"UNIVERSAL" FLOOR STANDARD DISPLAYOR
Stands independent on floor. 2 Models, 7 and 12 wings. Wings quickly taken out and replaced. Wing sizes, 20x30", 29x29", 24x36", 30x40". Fine for exhibits.

TELL US YOUR PROBLEM, WE WILL HELP SOLVE IT AND RECOMMEND MOST SUITABLE KIND AND SIZE.
Write for Our Catalog No. 14 and Prices.

Universal Fixture Corporation

135 West 23rd Street New York City

Start the **NEW YEAR** Right by using Reliable Self-cleaning protection on your cable terminals, telephone arresters and central office protectors.

Three Hundred and Sixty-Five days' trial will convince you of the merits of sawtooth protection in eliminating dirty carbon troubles, interruptions to service and lowering maintenance cost. Trial order will be convincing.

Reliable Electric Company

3145 Carroll Avenue Chicago, Ill.

Consider International Phone Promotion Plans

London, Eng.—The three sub-committees of the International Consultative Committee for long-distance telephone communication which has been sitting in Paris, have concluded their labors, and a report of their recommendations is to be prepared for submission to the general meeting of the committee, which will take place in June next.

According to the Morning Post, a feature of the discussion was the proposal for the adoption of varying tariffs according to the hour at which a call is taken, the reduction proposed ranging from 25 to 50 per cent of the normal rate.

Another proposition concerns the possibility of enabling the public to obtain international calls at fixed hours, either on a regular subscription basis, or by ordering a call in advance for use at a prescribed moment. The possibility of devising means by which a person named may be called to the other end of the line at a determined hour to take a communication, and also the possibility of enabling information of various kinds to be gathered from a distant point by ringing the town in question were also considered.

In order to develop long-distance communication as speedily as possible, the sub-committee proposes some free international communications during slacker hours.

COMING CONVENTIONS.

Minnesota, St. Paul, St. Francis Hotel, Jan. 20-22.

Wisconsin, Madison, Park Hotel, February 10-12.

Nebraska, Lincoln Hotel, Lincoln, February 17-19.

North Dakota, Valley City, March 10-12.

Texas, Fort Worth, Texas Hotel, March 17-19.

Ohio, Columbus, New Southern Hotel, March 24-26.

Kansas, Topeka, Hotel Kansan, April 7-9.

Pennsylvania, Harrisburg, Penn-Harris Hotel, May 5-7.

New York, Rochester, Powers Hotel, May 13-15.

WESTERN CEDAR POLES
Treated or Untreated
G. W. SLACK LUMBER CO.
Kalispell, Montana
Producers of "Glacier Park Cedar Poles"

CEDAR POLES
NORTHERN ✣ WESTERN
BUTT-TREATING - GUARANTEED GRADES
ANY SPECIFICATIONS REQUIRED
BELL LUMBER CO., Minneapolis, Minn.

ARISTOS "COPPERWELD" WIRE
DOES NOT RUST
Line Wire, Messenger and Guy Wire
Twisted Pair, Ground Rods
COPPERWELD STEEL COMPANY
30 Church St., New York
129 S. Jefferson St., Chicago
403 Rialto Bldg., San Francisco
Braddock P. O., Rankin, Pa.

"Texas Black Beauty"
2T4
CREOSOTED POLES
Southern Yellow Pine—Straight, Full-Bodied—Pressure Treated Full Length—Safe Against Grass Fires—Decay Defying
TEXAS CREOSOTING CO., Orange, Texas, U. S. A.

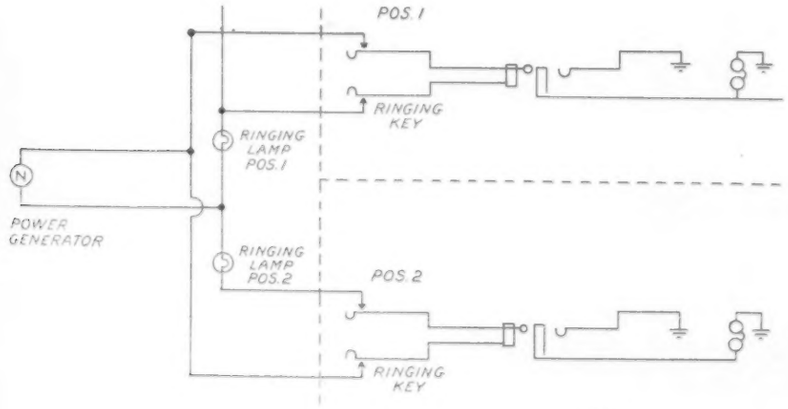
LINE AND DESK

ARC-OVERS ON RINGING KEY INSULATION

A neighboring exchange had had quite a lot of trouble due to arcing across the insulation of ringing keys and I was called in to replace some of the keys with new ones. I had changed two of the keys and was getting ready to quit when one of the new keys arced over. While I was looking over the key wiring, a visitor happened to notice that the ringing lamp on position 2 lighted when the operators on both positions 1 and 2 were ringing. We tested out the circuits and found that this lamp lighted whenever the operators in both positions rang at the same time on grounded lines.

After some figuring, we came to the conclusion that the ringing leads in position 2 were connected in a reversed manner to those of pos. 1. This is shown on the sketch. It will be seen that a circuit is completed from ground on the tip of the jack in pos. 2 through the lamp, generator and key of pos. 1 to ground on the tip of the jack in pos. 1. This would account for the lighting of the lamp. After the ringing leads in pos. 2 were reversed, the lamp no longer lighted.

This gave me an idea as to why the bushings in the keys were giving trouble. The keys are of the ordinary vertical type and the arc occurs between the generator springs and the main springs on the ringing side. If the operator in pos. 1 is ringing on a gounded line and the cord in pos. 2 also is in the jack of a grounded line, with the connections shown in the sketch, it will be found that the total voltage of the generator is placed across the insulation between the generator and ringing springs on the tip side of the cord in pos. 2. If a little dust collects and an arc occurs, the insulation is burned and after that the arc occurs whenever the connections are set up as described. As far as I know, no further ringing key trouble has developed since the change was made. — Contributed by Joe Biddle.



ONE WAY OF GETTING RIGHT-OF-WAY PERMIT

Several years ago, we were doing some construction work in one of our exchanges and found it necessary to use a certain street for a pole line. We anticipated some right-of-way difficulties, particularly along one piece of property. One day, however, I noticed the poles were set and the wires strung. I was rather curious to know just how permission had been obtained, but I said nothing to the foreman until the work was finished and the gang moved to another point. Then, one day I asked the foreman how he had secured the right of way. He explained it something after this fashion: "We were expecting some trouble, so I kept out of sight and sent Joe down to stake out the line. He put one stake right in front of the bay window alongside of the house and another in the way of the gate at the back of the lot. About half an hour later I came along and the lady was waiting for me. 'You men can't set a pole in front of my window nor one in the way of my gate.' Just as polite as I could be, I says, 'I guess the man that set the stakes didn't notice. Would it be all right if we move the stake from in front of your window to the corner and the other one up this way a little farther?' She finally agreed and we set the poles at the corner and along the side of the lot, where we had intended to set them, anyway."

That explanation cleared up the affair so satisfactorily in my mind that I did not inquire too closely as to how Joe had come to make the mistake of setting his stakes in the wrong places.—Contributed by a Telephone Manager.

BEWARE OF DEADLY GAS ENGINE FUMES

Newspapers daily are reporting many accidental injuries and deaths caused by the automobile on the streets, but there is another hazard in connection with the gas engine, about which not so much is heard, but which is just as deadly as the "speed demon." We refer to the fumes produced by the running of the engine, and which cannot be seen or smelled. Breathing these fumes, which are known as carbon monoxide gas, from the exhaust of a gas engine causes headache, nausea and vomiting. A heavy dose will cause unconsciousness and instant death.

Numerous cases have been reported in the past few months of persons being found dead in their garages, and upon investigation it was found they had been running the auto engine in a garage which did not have proper ventilation. Remember this: it makes no difference how large the room, it is dangerous to run a gas engine in any closed space unless the exhaust gases are discharged outside.

Dr. Yandell Henderson, Ph. D., professor of applied physiology, Yale University, and consulting psychologist, U. S. Bureau of Mines, makes this statement regarding the running of a gas engine in a garage: "Our observations indicate the character of the hazard in the small private garage. During the winter months, fatal asphyxiations in such private garages are quite common. The owner starts his car before opening the doors, in order to get the engine warm. If the

garage is ten by ten by twenty feet, giving a capacity of 2,000 cubic feet, and the car produces one cubic foot of carbon monoxide per minute it requires only one minute for a dangerous concentration to be reached, and in five minutes the atmosphere contains twenty parts of carbon monoxide in 10,000 of air—an amount sufficient to induce asphyxiation. Of course, if the car continues to run, the concentration mounts steadily toward a fatal amount."

The first steps in any treatment for carbon monoxide poisoning, of course, must be the restoration of breathing, if it has stopped. The prone, pressure method of artificial respiration is recommended by Dr. Henderson as superior to any apparatus, because it can be applied instantly, and a delay of even a couple of minutes, after breathing has stopped, may prove fatal. Fifteen minutes or longer always is fatal. After restoring spontaneous breathing, the elimination of the poison from the blood is the next step to be taken, and this, of course, should be done by some competent physician.—"Bell Telephone News."

HOW OPEN CIRCUIT FAULT FINDER WORKS.

The following answer to a query appeared in a recent number of the "Northwestern Bell." Inasmuch as many of our readers are likely to be interested in the test set used to make locations on circuits, where one side of the circuit is open, we are reproducing the answer:

"The open location test is one of a number of tests used by the testboard men to determine the cause and the location of troubles on toll circuits. It is made by using one of the fixed arms, called the A arm, and the rheostat arm, called R, of the wheatstone bridge in the test board as two arms of a wheatstone bridge circuit. The other two arms of the circuit are a carefully calibrated one microfarad condenser and the open wire to be tested. Low frequency alternating current is used in place of direct current used in the ordinary wheatstone bridge tests, and a galvanometer reversing relay is introduced into the circuit in order to maintain the current flowing through the galvanometer in one direction.

"As the open wire to be tested has a distributed capacity to ground which is approximately uniform for distances up to 200 miles of open wire and 40 miles of cable, if one side of the alternating current is connected to the common point of the A and R arms of the bridge and the other side to ground, we have a wheatstone bridge circuit consisting of two arms of non-inductive resistance and two arms having capacity. By adjusting the arm "A" and rheostat arm "R" until there is no current flowing in the galvanometer, according to the fundamental formula of the wheatstone bridge circuit, the resistance in arms "A" and "R" are inversely proportional to the capacities of the line (C_2) and condenser (C_1). Therefore $\frac{A}{R} = \frac{C_1}{C_2}$. If "A" equals 1000 ohms and C equals 1 microfarad, the above equation becomes $\frac{1000}{R} = \frac{1}{C_2}$ or the capacity of the open wire, $C_2 = \frac{R}{1000}$. If, for example, the value of "R" were 90 ohms we would have $C_2 = \frac{90}{1000} = .09$ microfarad, which is the distributed capacity of the open wire to ground.

In order to determine the location of the fault we make use of the value read on the "R" arm of the bridge, dividing this by the number of ohms per mile that have been previously determined by tests on good circuits over known distances or using 15 ohms per mile for open wire and 90 ohms per mile for cable. Thus if a balance is obtained when R = 90 ohms the distance to the fault would be $\frac{90}{15}$ = 6 miles if on an open wire line.

From this it is seen that while the actual capacity to ground can be determined as explained above, the value of the reading obtained on the "R" arm can be used directly if the number of ohms per mile is known from previous tests, or if it is assumed."

LINE AND DESK NOW IN THE INDEX

Readers of this department have called our attention to the fact that they frequently wish to refer to some of the valuable suggestions contained in it, months after the articles have been printed. This involves running back through many issues of the journal or searching through a large number of pages, if the practice of clipping the articles has been followed. We have even had that experience, ourselves. In order that this material may be available, after it has appeared, we are arranging that each article will be listed, individually, in the annual index of TELEPHONE ENGINEER which appears in this number. Under the caption, "Line and Desk Department," will be found the titles of the various articles, with the number of the issue and the page on which they appeared.

In the preparation of the present

TRADE MARK Red Devil Tools "Red Devil" THE WORLD'S STANDARD Better Made

"Red Devil"
Lineman's Safety Strap

There is probably no tool upon which the lineman's life depends so much.

Built with a sense of responsibility for men's lives, "Red Devil" Safety Straps have won a high rating among linemen for **SAFETY.**

No. 349—Extra heavy oak tanned leather. Linen stitching and copper rivets throughout. 1¾ inches wide, $3.75; 2 inches wide, $4.35 each.

Electrician's tool booklet free on request

Smith & Hemenway Co., Inc., *Mfrs. of "Red Devil" Tools*
263 Broadway New York, N. Y.

index, a number of interesting facts were disclosed. During the year nearly eighty articles were carried in the Line and Desk department. Practically every phase of plant work was represented by one or more of them, while a number of articles dealt with related subjects which may come before the manager of the smaller exchange who has other duties, in addition to caring for the plant.

No small part of the credit for the value of this department must go to the many contributors who have sent us suggestions for publication. To all of these we extend our cordial appreciation. The fact that this department has been worth while, is to the credit of the men out in the field rather than to those of our staff who have done the work of compiling the material. Many questions have been promptly and satisfactorily answered, and when handed a question for which we did not have the full information at hand, responses to our calls for help have been uniformly prompt and helpful.

We always are looking for ways in which this department may be made of more direct benefit to the man on the job or by which the quality of its material may be improved. We invite suggestions and contributions. While we have had many, there is, always, room for more. As in the past, we will continue to pay for all contributions that can be used. When you have done an unusual job, cleared a peculiar case of trouble, or found a way in which the work can be made easier or better, let us hear from you. Your fellow telephone men will be glad to have the benefit of your experience.

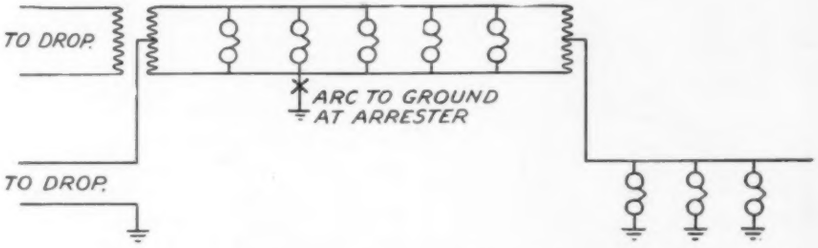
This All-Weather Reel Does the Work

A few inches of snow doesn't stop this cable pulling gang. Note the large

wheels upon which the cable reel is loaded at the warehouse. The loaded reel then is pulled to the job by the construction truck and is placed directly in position over the manhole. The wheels are blocked while the cable is being pulled.

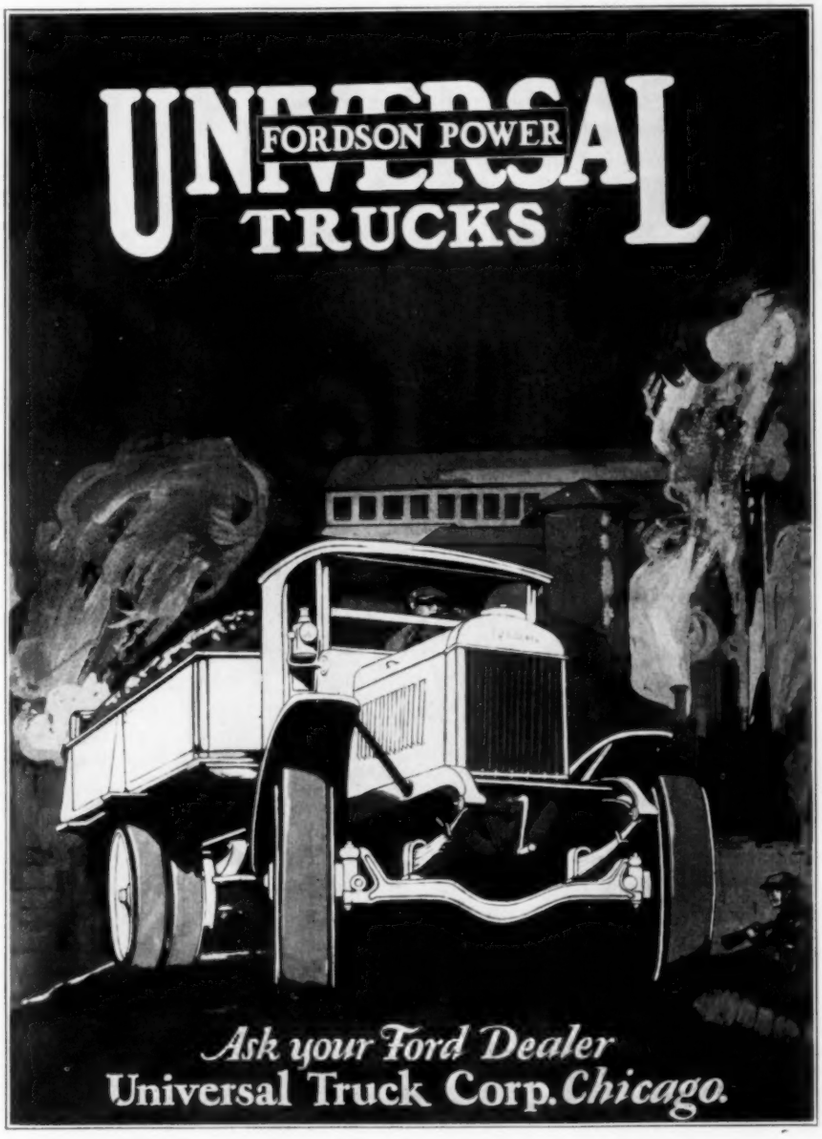
CASE OF PHANTOM CIRCUIT TROUBLE.

Here is a case of trouble on a phantom farm line circuit which may help some one. I had a grounded farm line



phantom which tested clear, but when the operator rang on the phantom the bells on the physical rang also. The voltmeter showed no ground on the physical and it tested O. K. for balance. Finally, I found the trouble at one of the telephones on the physical. The air gap of the arrester was so small that the current arced across to ground when the operator rang on the phantom. The sketch will show just how it happened.—Contributed by E. H. M.

Melbourne, N. Z.—Approximately $4,300,000 will be spent on telephone and telegraph extensions in New Zealand, and $1,800,000 on departmental buildings, this year if the recommendations of the Minister of Public Works as submitted to the House of Representatives, are adopted.



FREE

Get This Book To Cut Drafting Room Costs

This book of drafting room furniture will show you ways of saving floor space—ways for your men to work more effectively and economically—ways to actually cut costs by the installation of proper equipment.

Here you will find the newest improvements in steel and wooden filing cases, drawing tables, folding tables, drafting machines, stools, in fact everything for the drawing room. It will be a help in making your drafting room turn out most work for the least cost.

No matter how large or small your drafting room is, you should have a copy—no obligation. Mail the coupon today.

THE C. F. PEASE COMPANY
807 N. Franklin Street Chicago, Ill.

Just Mail the Coupon

THE C. F. PEASE CO.
807 No. Franklin St., Chicago, Ill.

Please send me your free booklet, "Furniture for the Drafting Room."

Name .....

Address .....

City .....

Western Electric Promotions Follow Bell Lab. Formation

New York City.—J. L. Kilpatrick has been elected vice-president of the Western Electric company in charge of the telephone department and a director of the company. He succeeds Dr. F. B. Jewett, who has become vice-president of the American Telephone and Telegraph company. In his new position Mr. Kilpatrick has supervision over the manufacturing, installation and telephone distributing departments of the company. He has also been elected vice-president and a director of the International Western Electric company.

Mr. Kilpatrick joined the Western Electric company in 1922 as general manager of installation when the work of installation became the occasion for a major department of the company. He served in the Bell System since he was nineteen years old and entered the switchboard installation department of the Bell Telephone company of Pennsylvania. He held the position of engineer of buildings and equipment during a period of this company's extensive expansion and later became assistant general manager and assistant vice-president.

J. L. McQuarrie has been appointed chief engineer of the International Western Electric company. He succeeds E. B. Craft, who has become vice-president of the Bell Telephone Laboratories, Inc. Mr. McQuarrie has held the title of assistant chief engineer, his service with the Western Electric company having been continuous since 1894.

H. B. Gilmore, since 1908 manager of the supply distributing organization of the Western Electric company at Boston, has been elected assistant secretary of the company at New York. Mr. Gilmore succeeds J. W. Farrell who has become secretary and attorney of the Bell Telephone Laboratories, Inc. He began his service with the Western Electric company in 1902 after his graduation from Dartmouth, where he was a member of the 'varsity football team. Starting in the supply organization at New York, Mr. Gilmore subsequently went to Chicago in the telephone sales department and from there directly to the managership of the Boston supply house.

RECONSTRUCTED EQUIPMENT

American Elec. 1600 ohm Non self contained ringers @	$ 1.00
Western Elec. 2500 ohm self contained ringers with gongs @	1.50
Am. Elec. Round bar 4-bar Bdg. hand Gen. complete with cranks @	1.50
Am. Elec. Co. Pony type 5-bar Bdg. hand Gen. complete with Cranks @	1.25
Am. Elec. Co. 4-bar Bdg. hand Gen. complete with cranks @	1.10
Kellogg No. 30 Straight line C. B. Business wall sets @	4.00
Stromberg No. 824 Straight line C. B. Wood hotel sets @	5.50
Stromberg No. 681 C. B. Desk sets with straight line steel signal sets @	7.00
Garford No. 1100 1-M. F. Condensers @	.30
Am. Elec. or Monarch Local Battery Ind. coils @	.35
Dean Elec. 3-bar 1000 ohm Bdg. desk sets @ $8.75—4-bar 1000 or 1600 ohm @ $9.25—5-bar @	10.25
Monarch 3-bar 1000 ohm Bdg. desk sets @ $8.50—4-bar 1000 or 1600 ohm $8.75—5-bar @	10.00
Leich Elec. 3-bar 1000 ohm Bdg. desk sets @ $9.00—4-bar 1000 or 1600 ohm @ $10.50—5-bar @	11.00
Monarch 4-bar 1000 or 1600 ohm Bdg. compacts @ $7.50—5-bar @	9.00
Am. Elec. 4-bar 1000 or 1600 ohm Bdg. compacts @ $7.00—5-bar @	7.75
Swedish Am. 4-bar 1000 or 1600 ohm Bdg. compacts @ $6.75—5-bar @	7.25

REBUILT ELECTRIC EQUIPMENT COMPANY, Not Inc.
E. C. Stoeffhaas, Mgr.
1940 W. 21st Street, CHICAGO, ILL.
We are not connected with or successors to Rebuilt Telephone Equip. Co.

W. E. Research Work to Be Done by New Bell Organization

New York City.—Directors of the American Telephone and Telegraph Company have announced the organization of the Bell Telephone Laboratories, Inc., to take over the laboratory and research work heretofore carried on by its affiliated company, the Western Electric Co. The formation of the new company was said to mean a greater concentration upon the experimental phases of the telephone industry.

In accordance with the plans for the new concern, F. B. Jewett, who has been vice-president of the Western Electric company, was elected vice-president of the American Telephone & Telegraph company as "a part of a program for further co-ordination of the research and development activities which have been constantly expanding." Vice-President John J. Carty was made chairman of an advisory board on research and development policies and also chairman of the board of directors of the Bell Telephone Laboratories, Inc., the new company.

The new company will be jointly owned by the American Telephone & Telegraph company and the Western Electric company. Mr. Jewett will be in direct charge of the research and development department of the American Telephone & Telegraph company and president of the new Laboratories company.

WANTED: TELEPHONE CONDENSERS

Want 2, 3 and 4 microfarad capacity; 150 to 500 volt breakdown test. Send samples in duplicate, with offers.

REX SALES CO.,
1954-6 79th St., Brooklyn, N. Y.

Wanted—Present address of C. D. Lindridge, formerly at 40 Haskine St., Providence, R. I. Address Box 77, TELEPHONE ENGINEER, 28 E. Jackson Blvd., Chicago.

High Lights of Illinois Bell Plans Are Published

Chicago, Ill.—The Illinois Bell Telephone company will expend more than $110,000,000 in the next five years to build extensions and additions to its plant to supply the demands for additional telephone service from the citizens of Illinois. During 1924 the company appropriated, for this work, a total of $22,810,360. It will have to expend more than this in 1925 and each of the years to follow.

In 1920 the company's average investment per telephone was $125. In 1924 this had risen to $146, and it is estimated that in 1929 this will be $175.

Nineteen twenty-four brought out, in violent way, the need of the company maintaining a proper depreciation reserve. A few days before Christmas, Illinois was visited by a severe sleet storm.

Within a few hours damage of more than $1,000,000 had been suffered by the telephone plant. More than 21,000 poles were on the ground in various parts of the state, and toll and long distance service was considerably hampered.

Million Per Day; W. E. 1924 Sales Record

New York City.—Sales of one million dollars for every working day in the year will be the record total for Western Electric company during 1924.

The new record, the highest in the fifty-five years of the Western Electric Company's history, represents in large measure a period of intensive effort by the Bell Telephone system to catch up with the continuously growing demand for telephones.

The sales of the company in 1923 amounted to $255,177,000, the next highest figure and in 1922 they were $210,941,000.

Charles C. DuBois, president of the Western Electric Company, made public the expected total of about $300,000,000 for 1924 in a statement which said:

"The high total in dollars and cents has been made despite the fact that the prices for most electrical equipment were generally lower during the past year than at any time since the war."

The International Western Electric company, figures for which are not included in the $300,000,000 total, has had the best year in its history.

Tough on the Subjects If King Is a Polygamist

When the King telephones, let all other instruments be dumb! That's the rule in Mecca, where King Hussein of the Hedjaz has had a telephone system installed, says a recent article in the New Zealand Herald.

The rule is effectively enforced by an automatic device which instantly disconnects all other telephones whenever the receiver is lifted from the King's instrument. As long as King Hussein's telephone is in use, no other telephone can be used in Mecca, save only the one with which the King is talking.

Ohio Utility Commissioners Call for Help

Columbus, Ohio.—This state's three utility commissioners are hoping that the next session of the legislature will add two more members to the commission body, so some relief may be had from the more than 800 cases awaiting hearings before the present commission. There are 42 telephone rate case hearings alone now on the commission schedule.

PLANT WANTED

Practical telephone man, at present employed, desires to invest $2,000, with services, in some going Independent company. I have had 8½ years' experience with the Bell Telephone Co. and 9½ years with Independent companies. References exchanged. J. E. Boatright, Crossett, Ark.

HELP WANTED

WANTED—Experienced man of ability to fill position of combination Wire Chief and Local Manager at an exchange of about 1800 stations. Equipment: old-style Stromberg-Carlson Common Battery; no competition. Man must have good recommendations as to ability and character. Salary, $175 per month with chance for advancement when merited. Address Manager, care TELEPHONE ENGINEER, 23 E. Jackson Blvd., Chicago.

J. K. JOHNSTON
Telephone Engineer
903-4 Lemcke Bldg. Indianapolis, Ind.
Has appraised exchanges as follow: Arkansas, 2; Florida, 2; Illinois, 8; Indiana, 219; Iowa, 5; Kentucky, 21; Michigan, 20; Missouri, 2; New Jersey, 2; New York, 2; North Carolina, 6; Ohio, 71; Pennsylvania, 23; South Carolina, 4; Tennessee, 12; Virginia 11; Total, 410.

COFFEY'S
Central Accounting Department
Keeps the records and makes up all reports for companies (large and small) in 17 states. The cost is about half the salary of a bookkeeper. It will not cost you anything to inquire as to our plan, charges, etc. Write today.
Coffey System & Audit Co., Indianapolis, Ind
National Convention, Room 110

J. G. WRAY & CO.
Telephone Engineers
Specialists in Appraisals, Rate Surveys, Financial Investigations, Organization and Operation of Telephone Companies.
J. G. Wray, Fellow A. I. E. E.
Cyrus G. Hill
1217 First National Bank Bldg., Chicago

Valuations Financial Reports
Rate Cases Plant Studies
Charles W. McKay
Telephone Engineer
440 WRIGLEY BLDG., CHICAGO

W. H. CRUMB
Telephone Engineer
9 South Clinton St. Chicago

Valuations—Supervision—Plant—Inductive Interference—Expert Administrative Counsel for Utilities
JAY G. MITCHELL
TELEPHONE ENGINEER
Member A. I. E. E.
1042 W. Monroe St. Springfield, Ill

Wanted—A copy of TELEPHONE ENGINEER for January, 1924. Will extend your subscription three months for same. Address TELEPHONE ENGINEER, 28 E. Jackson, Chicago.

THEODORE GARY AND COMPANY
KANSAS CITY, MISSOURI
Sixty-Sixth Consecutive Quarterly Dividend.
The regular quarterly dividend of $1.50 a share on the common stock and the Class "A" and the Class "D" Preferred stock, together with a dividend of $2.00 a share on the Class "C" Preferred stock, has this day been declared payable January 2, 1925, to the stockholders of record as of the thirty-first day of December, 1924, at 3 p. m. The books will be closed to transfer on December 24, 1924 and reopened on January 1, 1925.
(Signed) H. L. Gary,
Dec. 20, 1924. First Vice-President and Treasurer.

All Kinds of Printed Forms for Telephone Companies

Monthly Audits
General Accounting Systems Installed
Simplified Accounting for Small Companies

Every State in U. S. represented among our satisfied customers.

Bowdle Accounting System
CERRO GORDO, ILL.

Superior Rubber and Friction Tapes
Hot Galv. Pole Line Hardware
No-Burn-Out Soldering Irons
Cedar Poles, Northern and Western
Victor and Ace Batteries
Dowel Pins

A. J. Johnson Co.
217 No. Desplaines St., Chicago, Ill.
(Tel. Haymarket 9189)

Get your
Telephone Repair Work
done at the old reliable
Telephone Repair Shop
SUTTLE EQUIPMENT CO.
OLNEY, ILLINOIS

$37.50 Addressograph

CHEAPER than typewriter—SAVES 20% of YOUR present costs—5 to 15 times FASTER and BETTER than pen or typewriter.

FREE TRIAL will prove it!

Easy Pay't. Terms

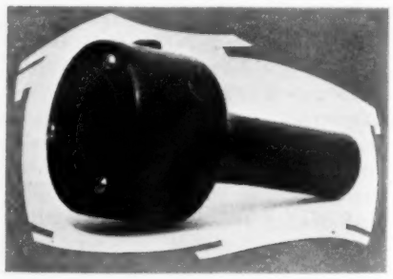
904 W. Van Buren St., Chicago, Ill.

WANTED: Chief Telephone Engineer well up in British P. O. circuits, manual boards and instruments by large firm of telephone manufacturers in England who are developing this side of their business. State age, salary required and when free. Strict confidence will be observed. Box No. 1202, Dorland Agency Ltd., 14 Regent St., London, England.

Discover "First Permanent Magnet" Receiver

Delaware, Ohio.—A quaint wooden-cased object said to be the first telephone receiver employing a permanent magnet, comes to light in the recent survey of the possessions of the physics laboratory of the Ohio Wesleyan university.

According to Douglas W. Miller, the institution's director of news service, the instrument was designed by Amos Emerson Dolbear, educator and

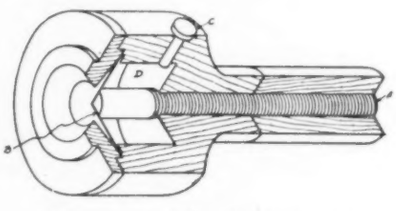


This is first permanent magnet receiver, is claim.

scientist of the older generation and a graduate of Ohio Wesleyan in the class of 1866. The receiver at Ohio Wesleyan dates back to Dolbear's undergraduate days, placing the time of its origin in the middle '60's while Bell did not obtain his patent on this type of receiver until 1876 and made application but shortly before his patent was granted.

The principle involved in this quaint curio is but one of many evolved from the keen mind of Professor Dolbear and a review of his work shows that in the achievements of this one alumnus Ohio Wesleyan has made contributions to the scientific world exceeded by few American universities.

In enumerating Dolbear's inventions, "the writing telegraph, 1864, the electric gyroscope, 1867, the magnetic telephone, 1876, the static telephone, 1879, and the air-space telegraph cable, 1882," are all credited to him by the Americana Encyclopedia. "Among his discoveries" this authority goes on to say, "were the convertibility of sound into electricity, 1873, wireless telegraphy, 1881, and electric photography, 1893."



Parts of Dolbear's Receiver

A—Hard iron core, threaded to vary distance from diaphram during experimentation.
B—Diaphram made of old tin-type.
C—Binding post.
D—Opening where there probably was a coil, now missing.

Although Dolbear, throughout his life, was greatly interested in the telephone and made many experiments with it, the principle of the permanent magnet for the receiver which is embodied in the old curio remaining at Ohio Wesleyan, was his greatest contribution.

Radio fans may note with interest the fact that Professor Dolbear held the first American patents upon wireless. In this connection Mr. L. S. Wells relates the following significant incident: "Along in the '90's came Sir Thomas Lipton, for the first time, to contest with this country in yacht races for the silver cup. He brought with him that Italio-Englishman, Marconi, the reputed inventor of the wireless telephone, to report the races. Just when everything was ready Dolbear, serving an injunction, stopped proceedings until the defendant came forward with the necessary funds for infringing on Dolbear's patent. Dolbear had a patent in the '80's at which time Marconi was as yet a mere school boy. It was then that the public seemed to realize, for the first time, that Dolbear was not a mere visionary man of hobbies."

At the conclusion of an address upon the telephone, read before the Society of Telegraphic Engineers in 1882, Professor Dolbear gave what will probably stand as one of the first experiments, if not the first, demonstrating wireless telephony. The system which he employed to make possible his demonstration was not that of radio as we know it today but was dependent rather upon a sort of magnetic induction.

Ontario's 1924 Telephone Report Is Issued

Toronto, Ont., Can.—Statistical information relative to the telephone systems within the jurisdiction of Ontario is presented in a publication recently issued by Francis Dagger, the Ontario Supervisor of Telephone Systems. According to the report there are 637 systems in the province, operating approximately 104,000 telephones.

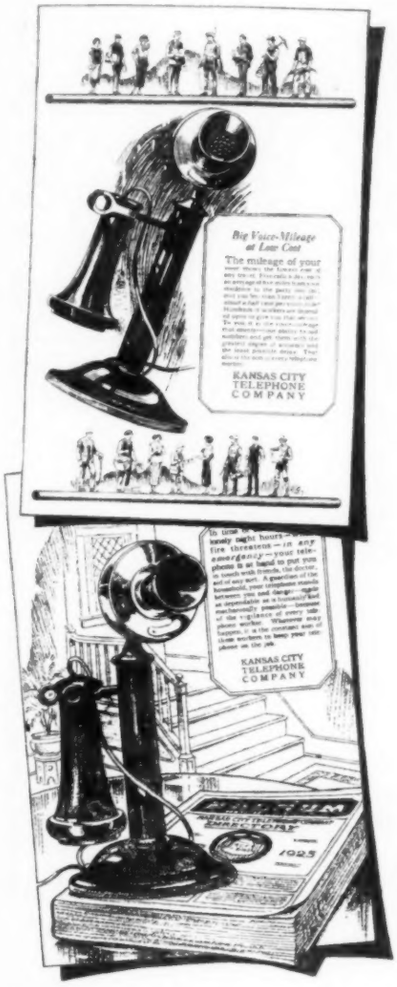
White Cedar Men Meet at Minneapolis, Feb. 10, 11

Secretary N. E. Boucher announces that the 29th annual meeting of the Northern White Cedar Association will be held at Minneapolis, Minn., Tuesday and Wednesday, February 10 and 11.

"Voice-Mileage" Kansas City Utility Emphasis

Kansas City, Mo.—Telephone subscribers of Kansas City are having the utility of their telephones impressed upon them in a different way by a series of advertisements in which the Kansas City Telephone Company is emphasizing "voice-mileage."

The distance vanquishing virtue of the telephone is brought sharply into focus by the copy in the campaign which cites examples to show that the



Here's how Kansas City advertises "Voice-Mileage" as cheapest Transportation.

mileage of the voice gets decidedly the lowest cost of any travel.

One advertisement reads, in part,

"BIG VOICE - MILEAGE AT LOW COST.

"The mileage of your voice shows the lowest cost of any travel. Five calls a day, each an average of five miles from your residence to the party you call, cost you less than 3 cents a call—*about a half a cent a voice mile!*

"Hundreds of workers are depended upon to give you that service. To you, it is the voice-mileage that counts—your ability to call numbers and get them with the greatest degree of accuracy, and the least possible delay."

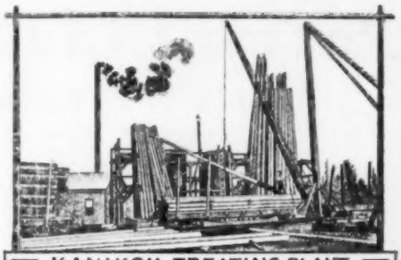
National Carbon Co. Goes After Big Business

The National Carbon Co.'s advertising—of Columbia Eveready Dry Cells, Eveready Radio Batteries and Eveready Flashlights—will appear during 1925 in 1,294,244,472 copies of American magazines and newspapers, or twelve National Carbon advertisements for each of the 110,000,000 people in the United States. Figuring five readers for each copy of every magazine and newspaper, means that a National Carbon message will appeal at least sixty times in twelve months to each American old enough to read. This is the biggest advertising campaign in National Carbon Co.'s history.

The gross newspaper circulation for 1925 will be 1,023,579,613; the gross magazine circulation, including magazines of general interest, farm papers, technical papers and trade papers, will be 270,664,859.

Counting 24,351,676 families in the United States, there will be enough copies of National Carbon Co.'s advertisements to insure each family an advertisement of Eveready Radio Batteries, Eveready Flashlights or Columbia Eveready Dry Cells at least fifty-four times in the course of the year—on an average, better than once a week.

There will be two campaigns in the magazine field: One, in behalf of Columbia Gray Label telephone cells, will be concentrated in the influential trade papers of the telephone field, while the big campaign, which will be spread through more than forty magazines, will run gross copies of Columbia Eveready Dry Cells advertisements to the extent of 58,589,813. The leaders in the general magazines will be used extensively and the farm papers will come in for a liberal share in copy which will stress the usefulness and excellence of the Columbia Hot Shot battery in agricultural pursuits. Throughout the entire campaign, the National Carbon Co. will carry out the closest cooperation with dealers. Broadsides to the trade will keep it fully advised of each campaign, and window and counter displays in great variety will be supplied as a further aid to dealers who are awake to the possibilities of tying up with so stupendous a background of national advertising.



KANIKSU TREATING PLANT

WESTERN
RED CEDAR
POLES
FROM THE
Kaniksu National Forest
All Styles of BUTT TREATING
KANIKSU CEDAR CO.
PRIEST RIVER, IDAHO
LOS ANGELES OFFICE
Harry G. Holabird - 451 E. 3rd St.
EASTERN OFFICE
F. C. Adams Co. - - Kingston, Pa.
DENVER OFFICE
Geddes & Aldom - 300 Int. Tr. Bldg.
KANIKSU RED CEDAR POLES

Everstick

Approved by Large Operating Companies For the Following Strains

6" 2-way	2,200 lbs.
6" 4-way	6,000 lbs.
8" 2-way	6,000 lbs.
8" 4-way	10,000 lbs.
10" 4-way	16,000 lbs.

Write for Details
Everstick Anchor Co.
ST. LOUIS, MO.

SCRAP PLATINUM
Highest prices paid for discarded or obsolete telephone and switchboard apparatus; platinum contact relays, ring keys, etc. Have specialized in this field for many years.
CONTACT METALS CO.
221 E. 23rd St., Chicago

Send for free sample and prices on
UNIVERSAL DROP WIRE INSULATORS
Universal Specialty Company
120-A, S. 7th St., Terre Haute, Ind.

Party Line Connectors

A Brief Discussion of Frequency Selecting Type of Connector Switch

By G. K. HASPEL*

In general, only one connector group is required per 100 lines when these lines serve individual, or P. B. X. subscribers, but for party-line service it has been the practice to provide as many groups of connectors per 100 lines as there are parties on the party line, that is, for two-party service, two connector groups per 100 lines are required and for four-party service, four groups.

The comparatively recently developed frequency-selecting connector which selects the ringing frequency (or other party-line station selecting feature), as well as connects to the called line, requires only one connector group per 100 lines, regardless of whether the line gives two-party, four-party or ten-party service.

It is obvious, with the regular connector method, that more connector groups will be required than line switch groups, or, in other words, the number of line switch groups will correspond to the number of hundreds of lines while the number of connector groups will correspond to the number of hundreds of possible stations.

In reducing the number of connector groups so that it corresponds to the number of groups of 100 line switches, the use of frequency-selecting connectors not only reduced the total number of connectors, but in many cases also reduces the number of selectors. This saving in equipment is illustrated in the attached sketches showing trunking schemes for an exchange of 800 lines of mixed individual and party-line service.

Fig. 1 herewith shows the switching scheme for 800 lines using frequency-selecting connectors and provides for individual and party-line service up to ten parties per line. Fig. 2 shows a scheme for the same number of lines, but for individual and four-party service with four connector groups for each 100 lines. In the latter scheme, 32 connector groups are required, making necessary the use of second selectors between the first selectors and the connectors, which is not necessary in the frequency selecting connector scheme, since the latter has only eight connector groups.

In Fig. 1, eight levels of the first selectors are used (the "1" and "0" levels are usually reserved for special services) but when more than eight groups of connectors are required, the introduction of intermediate selectors, with access to ten groups each, becomes necessary. Thus in Fig. 2, with 32 connector groups, four groups of second selectors are required.

In the two schemes illustrated, the same number of first selectors is required in each case; 137 second selectors are required in Fig. 2, while none are required in Fig. 1; and the number of connectors is greater in Fig. 2 because 32 smaller groups are required, as against ten large groups in Fig. 1.

Not only is more equipment required for Fig. 2, but there is also an increase in the battery drain per call, of about 7 per cent, due to the necessity of the second selector in the train of each call. The greater number of switches and associated equipment involved would also increase the maintenance costs.

Further advantages for the frequency-selecting connector scheme, when used for all services (excepting P. B. X. or trunk-hunting service), are: the use of any line for either individual or party-line service, and by mixing these on each unit a more equal distribution of traffic may be obtained; selective ringing of extension telephones; and the possibility of changing individual to party lines without changing the directory numbers.

The principle objection to the frequency-selecting connector scheme is the difficulty of providing intercepting service for "dead" and changed numbers. This is accomplished by the use of frequency relays bridged across the lines on which calls are to be intercepted and, if the number of calls to be intercepted is large, the cost of the relay equipment is considerable. However, in many exchanges, this intercepting service is not considered necessary, so in such cases the objection does not apply.

With frequency-selecting connectors,

(Continued on page 44)

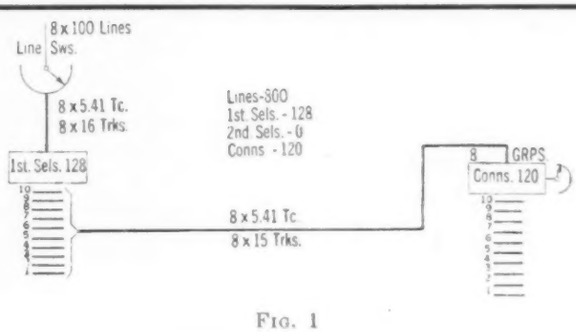


FIG. 1

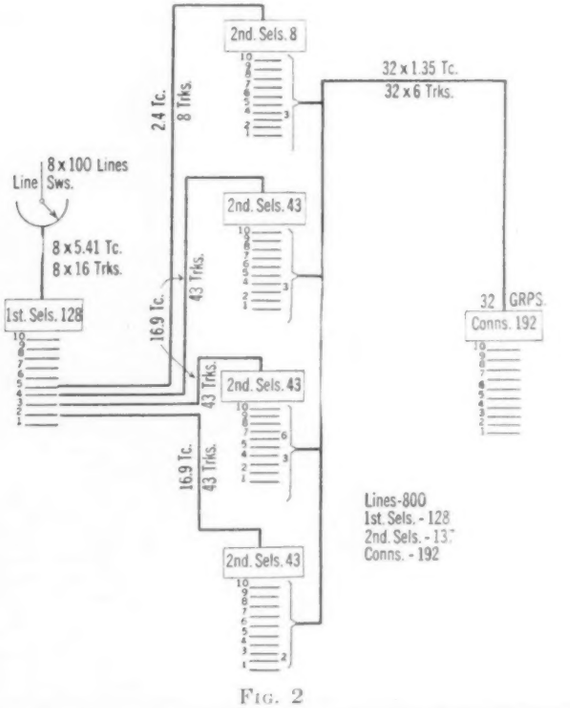
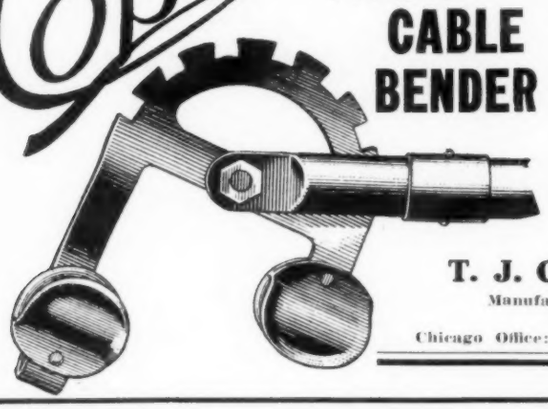


FIG. 2

*Discussion of a paper on "Economic Development of Step-by-Step Automatic Telephone Equipment," Journal of the A. I. E. E., Dec., 1924.

"Cope"

TYPE C
CABLE
BENDER



The increasing demands for larger sized cables in underground electrical transmission has created a demand for a cable bending tool so constructed that it could be adjusted to meet every condition or requirement that might arise in the placing of cables in manholes or vaults without disturbing other cables.

The Cope Type "C" Bender will meet these requirements.

The Cope Type "C" Bender is designed especially for bending soft core cables without injuring the lead, and to eliminate the necessity of redressing after bending.

The Cope Type "C" Bender is made of steel throughout, tested to withstand any reasonable strain that it would be subjected to. Its adjustments will permit the handle to be placed in seven (7) different positions.

No tool cart is fully equipped without one of these Benders.

T. J. COPE, 2112-2114 Samson St., Philadelphia, Pa.

Manufacturer of Tools and Supplies for Underground and Overhead ELECTRICAL EQUIPMENT

Chicago Office: No. 19 So. La Salle St. Western Electric Company, Distributors

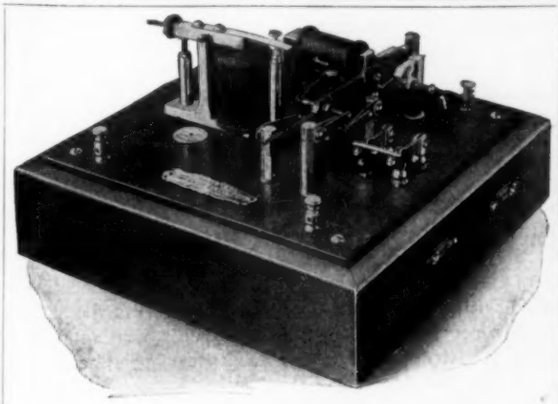
EVER-PROTECT

Hundreds of telephone companies are profiting from the lasting underground cable installation they have made with EVER-PROTECT.

You can see from the border illustrations all there is to the work.

Write for important data—today.
Order from your jobber or direct.

NATIONAL CABLE COMPOUND CO.
Incorporated
MITCHELL - - - - - - - - INDIANA



WARNER
POLE CHANGERS

—for more than 20 years Warner Pole Changers have been establishing their strong position as standard equipment in the telephone industry.

The number of installations is near the 30,000 mark; and that's one of the best endorsements of Warner excellence you could ask.

Write for complete details.

WARNER ELECTRIC COMPANY
MUNCIE, INDIANA

"REBUILT" TELEPHONE APPARATUS and exchange equipment **saves** you 30 to 50 per cent without sacrificing quality or efficiency.

SWITCHBOARDS—Telephones—Apparatus—Protection Equipment—Cable—Everything you need for the installation and operation of a complete exchange—Magneto or Central Energy—of the best and most reputable manufacturers.

Fourteen years' successful operation of our rebuilt equipment department puts it past the experimental stage. Quality and price will make you a permanent customer. Better investigate.

BARGAIN BULLETIN NO. 78 FREE
Address "REBUILT" EQUIPMENT DEPARTMENT
Premier Electric Company 1800-4 Grace St. Chicago, Ill.

CEDAR POLES
For Economy and Service
Buy your poles direct from a pole producer in a pole country.
J. J. SEGUIN
579 St. John Street Quebec, P. Q., Canada

Specially insulated plugs. U. S. Patent 1302471. In use in five continents. Prices c. i. f. any place.

TELEFON FABRIK AUTOMATIC
7. AMALIEGADE COPENHAGEN DENMARK

Cylinder Bellows

Indispensable for cleaning switchboards and electrical machinery. Will not short circuit. Powerful air pressure removes dust from inaccessible places which cannot be reached with a cloth or brush.

For sale at all electrical supply dealers

P. PEIFFER 80 Liberty Street Newark, N. J.

(Continued from page 42)

each line has a possible ten directory or station numbers and, when less than ten stations assigned to a particular line, the remaining numbers are useless. This has been called a "waste of numbers," but, since no waste of equipment is involved, the loss is not a material loss, and the objection is not considered valid. Moreover, whether all the numbers are used or not, they are available for use, which gives them an actual economical value.

The frequency-selecting connectors are somewhat more expensive per switch than the regular type connectors, but this is often counter-balanced by the decrease in the amount of selectors and connectors required for the entire office or exchange, or, even if the total cost is greater, it is quite possible that the service advantages will justify the extra expense.

J. R. Kearney Made Matthews' Electrical Sales Chief

St. Louis, Mo.—James R. Kearney, one of the country's authorities on line material, has been made a director and manager of electrical sales for the Matthews corporation. For nineteen years Mr. Kearney has been associated with the Matthews corporation. He also served for some time with the Western Electric Company as specialty man on line material.

He is the inventor of many widely used items in line construction work, having exhibited in this activity his splendid background of practical electrical work in which he has been engaged since boyhood.

Forecast Great Radio Advance in 1925

Chicago, Ill.—A cablegram to the Chicago Daily News says: "Radio telephony, international broadcasting, tele-vision and the transmission of light, heat and power by wireless are forecast for the year 1925 in radio by experts who have surveyed past and present progress and attempted to appraise prospects for the immediate future.

"It will not be long before it is possible, under favorable conditions, to connect telephone subscribers in the United States with telephone subscribers in European countries, permitting them to talk with each other as they would from San Francisco to New York, in the opinion of J. D. Ellsworth, vice-president of the American Telephone and Telegraph company.

"Through the co-operation of the telephone company and the Radio Corporation of America a group of men in New York not long ago answered by radio queries sent to them by cable from London, England, having no broadcasting station equipped to answer back. With installation by the British post-office of a 200 k w. radio telephone plant at their new station at Rugby, England, expected to be completed within six months, the first real step will be taken in the direction of international radio telephony. The success of the experiment between these two countries, Mr. Ellsworth predicts, will be followed by other countries joining to organize a world-wide system."

Stromberg-Carlson Produces New Loud Speaker

Rochester, N. Y.—No. 2A loud speaker is the latest radio product of the Stromberg-Carlson Telephone Mfg. company. The new loud speaker operates without extra batteries or extra stages of amplification and works with any standard tube receiving set. In construction the new speaker is said to be one of the notable radio achievements of the past year, reproducing speech and music in true tonal qualities, and giving an abundance of sound.

Dr. Pupin Is Made President of the A. A. A. S.

Washington, D. C.—Dr. Michael I. Pupin, the engineer and inventor responsible for important advances in telephone communication, has been elected president of the American Association for the Advancement of Science here. He is professor of physics at Columbia University, New York, and his autobiography, "From Immigrant to Inventor," recently created great interest in both scientific and lay circles.

Bell 1925 Construction Budget $265,000,000

New York.—American Telephone & Telegraph Co. will expend $265,000,000 for additions and improvements in 1925, equaling record budget for current year. For five years to end of 1924 company will have expended for construction more than $1,000,000,000. From 1904 through 1925, expenditures will have totaled $2,223,000,000.

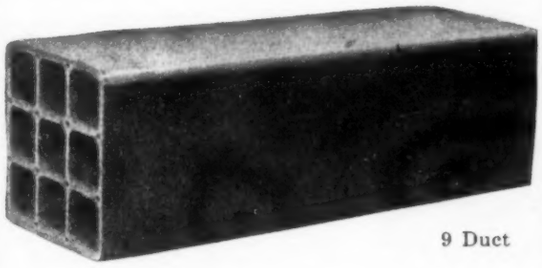
Infant Radio Business Giant in Income

The value of the radio business is nearly twice as great as that of the carpet and rug business. For every dollar spent on furniture, thirty-three cents is spent on radio. For every dollar spent on boots and shoes, twenty-five cents is spent on radio. For every dollar spent on musical instruments—pianos, organs, band and orchestra, phonographs and even the lowly harmonica—seventy-five cents is spent on the radio. The value of the radio business is three-fourths of the jewelry business with its clocks, watches and novelties.—Interstate Relay.

Where the Frauleins Are Trained

Germany is training its telephone operators with the proverbial German thoroughness. One detail of the curriculum is the training in enunciation, where the candidates are put wise to the tricks of the tongue.

MANUFACTURERS OF



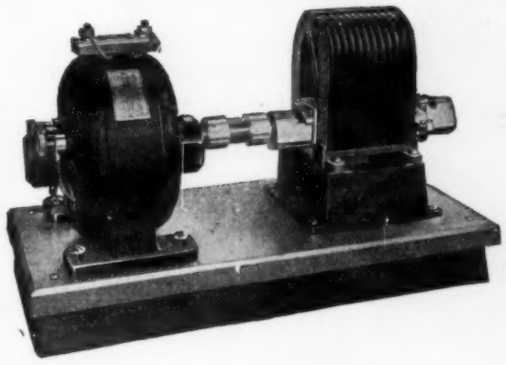
9 Duct

VITRIFIED, GLAZED, CLAY CONDUIT

We carry large stocks of round singles, square single, two, three, four, six and nine duct, in standard and short lengths, splits, mitres and bends.

SERVICE and QUALITY
GUARANTEED

THE CLAY PRODUCTS CO.
BRAZIL, INDIANA



THE HOLTZER-CABOT MAGNETO RINGING MOTOR-GENERATOR

Frees you from the necessity of battery testing and contact adjustments;

Saves the money you were wont to spend for battery renewals;

Cuts out the necessity of hand ringing, with its retardation of service, and consequent unpleasant intercourse between your subscribers and your operators;

Insures a uniform ringing current, obviating the necessity for your subscribers to complain that their bells do not ring satisfactorily.

THE HOLTZER-CABOT ELECTRIC CO.

Boston Detroit Philadelphia Baltimore
Chicago New York Minneapolis St. Louis

"INDIANA"
TELEPHONE AND TELEGRAPH WIRE

PROVEN BEST BY TEST

Time and the aid of America's foremost engineers, have enabled us to develop and manufacture the highest grade wire known to the trade. It is greatest in conductivity and lasting qualities, due to the superior quality of material from which it is made, as well as its *Extra Double Galvanizing*, which insures longest life.

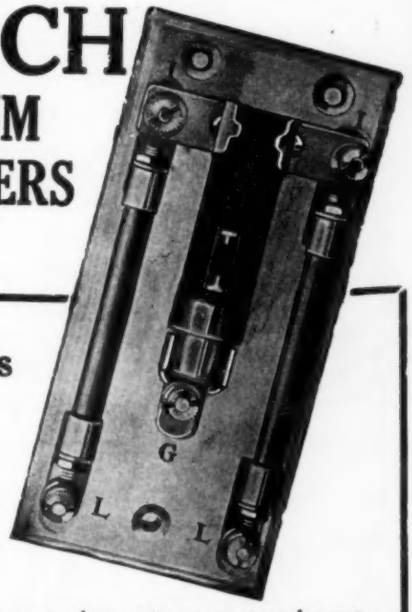
STEEL STRAND

Single and Double Galvanized, Standard, Siemens-Martin, High Strength and Extra High Strength Grades.

HANDLED BY MOST JOBBERS

MANUFACTURED BY
INDIANA STEEL & WIRE CO.
MUNCIE, INDIANA

BRACH
VACUUM
ARRESTERS



at prices within your reach

When the best protection costs no more, why not have it? BRACH arresters insure; non-grounding of lines, cables, clear transmission, balance of potential between pairs, and full protection against power crosses or lightning. There are no carbons to clean and no maintenance bills.

You can readily afford BRACH Vacuum Arresters at our present low prices. Type 440, shown above, is furnished with porcelain base, fuses and mountings.

L. S. BRACH MFG. CO.
NEWARK, N. J.

STANDARD Telephone Cables

are manufactured from the best materials by skilled workmen. They embody the most advanced ideas in telephone cable manufacture.

If interested in dependable cable at a reasonable price, write our nearest office.

Standard Underground Cable Co.

BOSTON NEW YORK PHILADELPHIA WASHINGTON PITTSBURGH DETROIT CHICAGO ST. LOUIS SAN FRANCISCO

THE "STEWART" DETECTO-METER

Saves many times its cost locating bad joints, checking receivers, induction coils, etc. The only practical instrument of its kind, measures resistance direct in ohms and operates on one dry cell.

It is also a battery tester and a voltmeter.

One user says, "I would not take $400 and get along without it."

Sent on trial

STEWART BROTHERS, Ottawa, Ill.

YAGER'S Soldering Salts

Old, tried, safe, quick Economical.

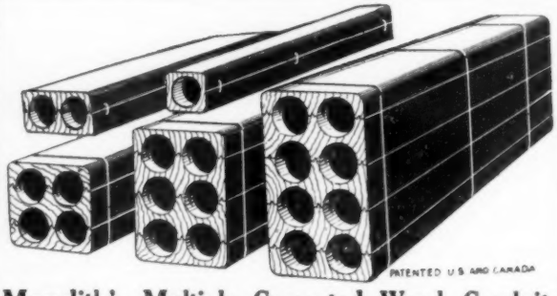
Used wherever soldering is done.

Packed in ½ lb., 1 lb. and 5 lb. enameled cans.

Sample on request.

Alex. R. Benson Co., Inc., Hudson, N.Y.

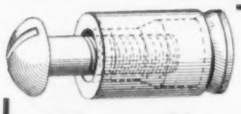
For list of distributors, see McRae's 1924 Blue Book



Meredith's Multiple Creosoted Wood Conduit

3-inch bore, 2 to 12 duct
Single conduit 2, 2½ and 3-inch bore

W. C. MEREDITH ATLANTA, GEORGIA



The "hump" holds in the hole

Greater expansion, with a given amount of lead, lends maximum holding power to the Chicago Expansion Nut. Pressure is distributed evenly in all directions; there can be no cracking or splitting of material.

Because of its strength, simplicity and economy, the Chicago Expansion Nut is standardized by leading telephone companies.

Samples and prices on request.

CHICAGO EXPANSION BOLT CO.

9 So. Clinton St., CHICAGO, ILL.

Also manufacturers of Bridle Rings, Toggle Bolts, Expansion Bolts and Expansion Pipe Hooks.

Note Protection at Corners

Blake Insulated Staples

Unequalled for telephone and bell wiring. The fiber insulation prevents troublesome short circuits and grounds. 4 sizes. Pat. Nov., 1900. Write for samples.

Blake Signal & Mfg. Co.

BOSTON, MASS.

American Steel & Wire Co.'s W. & M.

Telephone Telegraph Wire

STRAND STEEL WIRE

POLE STEPS

Descriptive Literature—free

American Steel & Wire Company

CHICAGO NEW YORK

AUTO TRAILER

$39.00

Here is a light Auto Trailer, weight 275 pounds, with a carrying capacity of 1,000 pounds. Sizes of body, 40x72 inches; 12 inches high. The wheels, hubs, bearings, springs and spring shackles are interchangeable with the Ford car.

Price does not include pneumatic tires. We do not furnish or handle any tires, most customers prefer to furnish their own. The wheels are regular Ford clincher 30x3½.

With sheet of illustrated instructions furnished it is easy to have your local garage or machine shop make up and attach a bracket to any make of automobile to hitch the trailer to.

THE BOWER MFG. CO.

FOWLER, INDIANA, BOX 99

STROWGER AUTOMATIC
REG. U.S. PAT. OFF.

In All Styles For All Types Of Service

Type 21 telephones may be had arranged for straight manual service,

Equipped with writing pads for those companies that wish to prepare for automatic service without advertising their intentions,

YOUR search for the ideal common battery telephone is ended. Type 21 Common Battery Telephones surpass the expectations of the most exacting telephone engineers and operating men. Their mechanical features are up to the minute in every detail, and for transmission and receiving qualities they cannot be matched anywhere.

They are available in all of the four styles shown on this page, in both wall and desk types, for manual or automatic service; or equipped with either dial blanks or writing pads for present manual and future automatic operation.

Type 21 telephones are wired for any desired type of service—straight line, harmonic, divided ring, rural—or in any combination to meet your individual needs.

For efficient, economical service in automatic exchanges,

Or fitted with dial blanks for present manual and future automatic operation.

Write for samples and prices

Automatic Electric Company

1033 W. Van Buren Street

CHICAGO, ILLINOIS

The worst storm in forty years taught them that the "holdingest" anchor is the

NEVER-CREEP

In December the worst storm in forty years so far as telephone lines are concerned, hit the middle west.

Right after the storm hit, our jobbers and our plants were deluged with orders. Telephone men advised us that corners where Never-Creeps were used stood staunch and straight despite the record-breaking burden of sleet-covered wires.

Not a fraction of an inch did the Never-Creeps give.

Thus was the proof of our claims made manifest in a way that will save our new buyers a lot of money in the future.

The Never-Creep is aptly named. It takes hold against undisturbed earth, and there is a vast solid holding surface. Its patented Thimbleye on the guy-rod preserves the guy-wires, so they stood faithful during this costly storm.

NEVER CREEP
THE NEVER CREEP CANNOT CREEP IT PULLS AGAINST THE SOLID UNDISTURBED EARTH
ALL DISTURBED AND MOISTURE EFFECTED EARTH IS BACK OF THE NEVER CREEP

Now, with all the reconstruction you have to do as the result of the storm, make the Never-Creep your standard. It is easily installed. It's the one anchor that the storm sold good and strong to the indifferent and the skeptical. If you're in a part of the country that winter storms don't hit, take a lesson from this anyway. You might as well get all that your money can buy in anchors. The Never-Creep is the answer.

NEVER-CREEP ANCHORS
are stocked by all leading jobbers

CHANCE COMPANY

CENTRALIA, MO.

ANCHORS SOCKET WRENCHES PROTECTORS BACK TRUSSES BRACKETS

Manufactured in Canada by N. SLATER CO., Inc., Hamilton, Ont., Canada.
Distributed in Canada by NORTHERN ELECTRIC CO., Inc.